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URBAN TRANSPORTATION PLAN

MISSOULA, MONTANA

Prepared for

MISSOULA CITY-COUNTY PLANNING BOARD

In cooperation with

MONTANA HIGHWAY COMMISSION
U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

By

CLARK, COLEMAN & RUPEIKS, INC.
PLANNERS, ECONOMISTS, ENGINEERS
SEATTLE, WASHINGTON - HELENA, MONTANA

October, 1967

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* engineering * research

October 2, 1967

Missoula City-County Planning Board
County Commissioners, Mayor and City Council
County Courthouse
Missoula, Montana

Gentlemen,

We are pleased to submit the Urban Transportation Plan report for the Missoula Planning Area. The Plan provides for present and forecasted traffic demands and land access requirements with an improved level of service. It also establishes a structure within which the community may effectively grow and develop.

The Urban Transportation Plan development was carried out concurrently with the preparation of plans for Land Use, Community Facilities, and the Central Business District. Together they form the Comprehensive Development Plan for the Missoula Planning Area which was presented in a separate report, dated April 24, 1967.

This report presents in detail, the basic inventories on street and highway facilities, current and forecasted economy and population, land use, parking, travel, and analysis of existing and future route needs. A recommended plan of street and highway improvements is described in detail, including costs, and means of implementing the plan.

We are grateful for the excellent assistance provided by the Technical and the Citizens Advisory Committees. We appreciate the cooperation provided by the citizens in the community in responding to the various surveys and to the news media for creating public awareness and keeping the citizens informed during the course of the study.

We trust that the Transportation Plan will be used as a guide by those responsible for providing adequate transportation facilities. Its true value will be realized if it directs action and decision toward common goals mutually supported by all levels of government.

Respectfully submitted,

Robert S. Clark
Vice-President

Mart Kask
Transportation Engineer

MK:m

Registered Professional Engineer
Montana No. 2564E

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CHAPTER 1

CHAPTER I INTRODUCTION

The horsedrawn carriages of a youthful Missoula required little in the way of road accommodations; narrow lanes, with the larger rocks rolled aside, were sufficient. Road construction was not a drain on the treasury either, since the passage of enough vehicles over the same route produced the required "road." If inclement weather temporarily put the road out of order, the early citizen simply cancelled any trips. His job, after all, was at home, as were most of life's necessities. Travel to town for supplies or to a neighbor's house for socializing was usually not urgent.

Since early roads came into being as a result of house-to-house or home-to-town travel, residences and especially businesses located just off the main roads for convenience of access. Thus, at a relatively early stage in Missoula's development, road patterns and street widths became fixed in the area later to become the Central Business District and surrounding territory.

The invention of the automobile did not have an immediate impact on Missoula's road system. By 1930, the City had over half of its 1960 population and the effect of the automobile was still slight. Not until the years following World War II did the City's road network begin to experience increased motor vehicle travel. Between 1945 and 1965, the number of vehicles tripled.

Accompanying this trend was the growth of Missoula itself. An increased specialization and socio-economic interdependence became apparent. The self-sufficient pioneer disappeared as people worked, shopped and spent leisure hours in different places. The City spread out, too, since the effect of increased spatial separation was negated by shortened travel times.

THE TRANSPORTATION PROBLEM

The basic transportation network in the Missoula area evolved from the demands of a sparsely populated, non-automobile-oriented society. With population increases and more intense usage of the automobile, an overloading of the system was inevitable. The initial problems arose at specific locations, and were solved on a piecemeal

basis. In general, Missoula's efforts toward coping with the growth to date have produced relief only after conflict areas have become obvious and irritating. Coupled with problems of legal entanglements and construction lag time, remedial action was often late in coming.

The fundamental problem is to anticipate future growth and to provide for it in an orderly, logical manner within the financial capabilities of the area. This must be accomplished not just for the incorporated area, but rather for the associated region over which the City of Missoula exerts an influence.

THE STUDY

Recognizing the fact that transportation is a basic force in shaping the course of urban development, the Montana Highway Commission and the Missoula City-County Planning Board authorized a transportation study. The purpose of this planning was to direct the development of transportation facilities toward raising urban standards and enhancing the aggregate of community values.

Organization

In the Missoula area, there is an ever increasing need to develop improved means of identifying the common goals of the region. Although community desires and goals can be recognized on a local basis, it is necessary that effective planning be done on a regional scale, the level at which economic and social activities interact. Cooperation of the governmental levels having jurisdiction within this region - the State of Montana, Missoula County and the City of Missoula - is essential to the planning and implementation of a comprehensive transportation system.

This study was conducted under the sponsorship of the Missoula City-County Planning Board, which functions in an advisory capacity to the Mayor and the City Council of Missoula and the Missoula County Commission. The complete organizational structure is portrayed graphically in Figure 1. Representation by agencies from all levels of government is indicative of the comprehensive attitude exhibited by this study.

The inclusion of a Citizens Advisory Committee in the study organization helped gain public understanding of the

ORGANIZATIONAL STRUCTURE
URBAN TRANSPORTATION STUDY

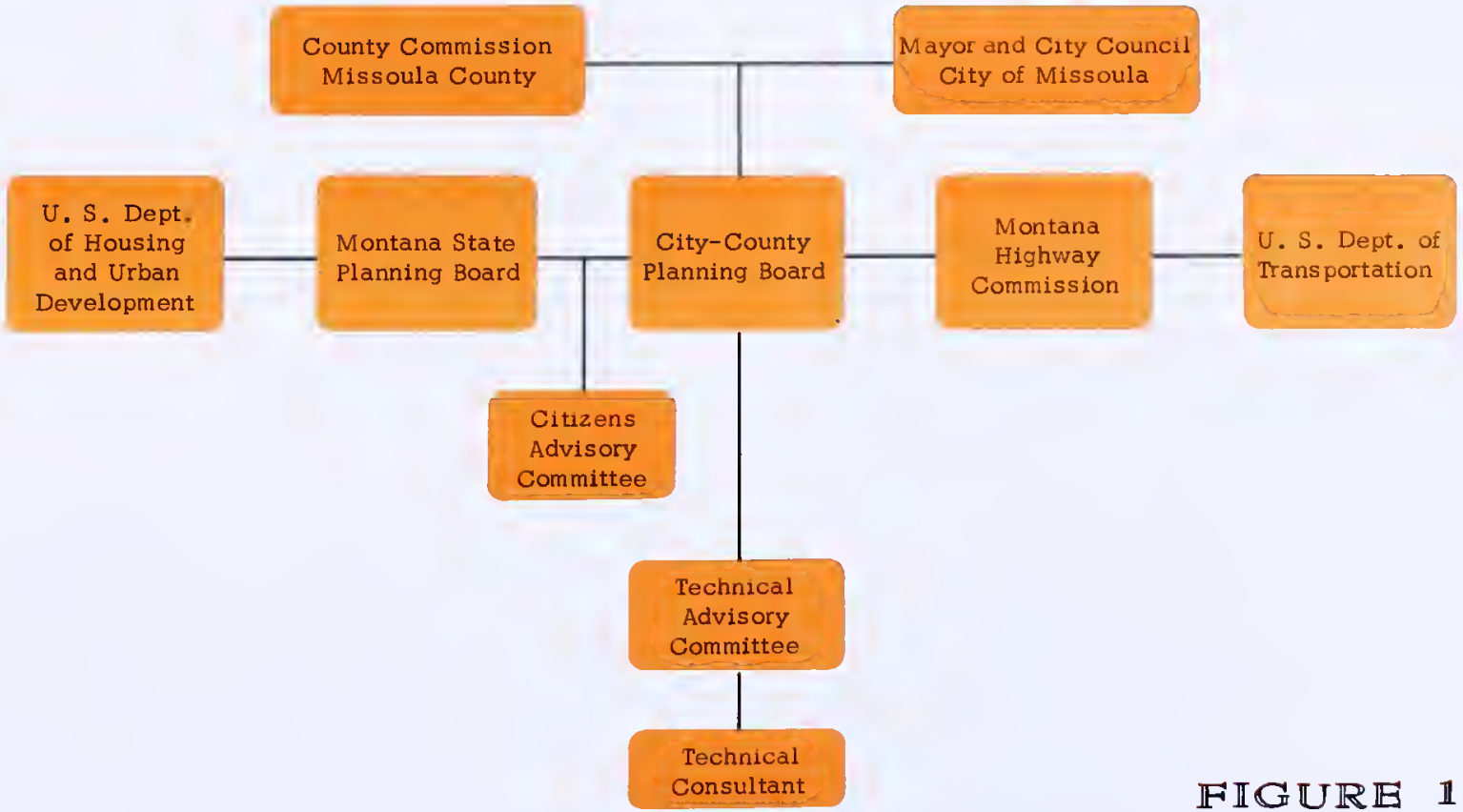

FIGURE 1

nature and output of the planning effort, and provided for citizen participation with the decision-making agencies at the appropriate points in the planning process. In an attempt to obtain regional concensus, the Citizens Advisory Committee contributed to the formation of goals for the Transportation Study.

Objectives

The objective of the study was the formulation of a transportation plan as part of a general development plan for the region. This included, as a primary concern, the creation of a balanced and integrated plan and program for the staged development of parking, streets, roads and highways in a manner that will serve the Missoula area and the State of Montana efficiently and effectively.

In keeping with the continuing aspect of this study, it was essential that basic data and facts be provided, so that future review and re-evaluation of the plan by public officials and other interested groups could be easily accomplished. The effective use of this information at a future date will depend greatly upon how well this study has established a workable administrative mechanism of local governments and State and Federal agencies. The development of this mechanism enhances not only the planning efforts, but also the implementation program.

An additional objective was to serve the projected land uses and to meet the anticipated travel requirements. In some areas this may involve the improvement of existing facilities, while in other areas, presently without service, new facilities must be programmed. In both cases, this must be done within the practical economic ability of the responsible agencies.

Study Area

The area included in the Missoula Transportation Study cannot be delineated using conventional boundaries such as city limits, county lines or natural barriers. Rather, the Study Area boundary was drawn, in view of present and anticipated growth of the region, to encompass the area expected to be affected by urbanization within the next 20 years. The amount of travel entering and leaving the Study Area from areas beyond is small when compared with the internal travel.

The Planning Process

One of the first tasks of the consultant's staff was to establish a complete work program to ensure that every aspect of the study was properly investigated. This guaranteed an overall study design which would accomplish the objectives of the study. Experience gained through comprehensive studies elsewhere suggested improvements and modifications which were incorporated into this study.

Regional transportation planning is based upon the premise that travel within an urban area follows a periodic and rational pattern. It is assumed that these trends and patterns are statistically predictable.

The forecasting of the human activity associated with travel is part of the initial planning process. The factors creating or influencing travel - land use, socio-economic patterns and mobility characteristics - were evaluated. Studies were made of population characteristics, economic activities, growth patterns and physical characteristics of the region.

The transportation study design incorporated four well-defined phases. The initial stage, a survey of the present situation, consisted of gathering data on existing travel, transportation and terminal facilities, and community development. The second phase included an analysis of the present travel relationships. The prime objective of this section was to determine the fundamental regional parameters of travel.

Forecasts of future economy, population, land use and its travel implications were the next step in the planning process. The objective was to predict the future growth and change of the region. The fourth phase in the process involved the plan preparation. Techniques utilizing electronic computers were employed to simulate future traffic loads on alternative systems. The appraisals of the adequacy of the street and highway system to accommodate these traffic loads, and the configuration of the travel patterns through the sections which would be overloaded, were the basis for determining the additions or modifications necessary to achieve a balance between travel demand and system capacity.

COORDINATION WITH LAND USE PLANNING

Concurrently with this report, a comprehensive development plan for Missoula was prepared. Because the reports were

prepared in a coordinated manner, progress toward implementation of the transportation plan as an integral part of the overall plan for future development of the Missoula Region is assured. Few general developmental policy decisions appear open for future deliberation because the sponsorship of one local agency, the Missoula City-County Planning Board, has minimized the conflicts of time and governmental jurisdiction.

In a final analysis, a transportation system must serve the needs of the region, without unduly burdening the City of Missoula. This report details the planning of such a system. The plan is designed to serve forecasted travel demands without infringing upon established community values. The complete study design, from the survey of existing conditions to a program for continued study, is outlined in the following chapters.

CHAPTER 2

CHAPTER II CURRENT STREET AND TRAFFIC CONDITIONS

The proper functioning of the City of Missoula requires an adequate system of arterial streets, county roads and state highways. Such a system should not only supplement the recently constructed Federal Interstate Highway, but also serve the travel demand created by growth in the Missoula Urban Area.

A proposed system can serve these purposes only if it is based upon a thorough study of existing conditions. Problems of congestion, travel time delay and accident hazards can then be located and remedied in time to meet the increased travel demands of the future.

An analysis of existing traffic conditions is presented in this chapter. Traffic volumes and variations, traffic controls and regulations, street capacities and traffic accidents are discussed.

REGIONAL TRANSPORTATION

Located in west-central Montana, Missoula is situated at the crossroads of U. S. Highways 10, 12 and 93. U. S. Highway 10 connects Missoula with Butte and Billings on the east and Spokane, Washington on the west. U. S. Highway 12 links Missoula with Helena and Miles City on the east and with the recreational areas of north-central Idaho on the west. U. S. Highway 93 serves as a commercial and recreational route between Kalispell and Central Idaho. All three routes are part of the Federal-Aid Primary System of Highways. Interstate 90, a part of the National System of Interstate and Defense Highways, passes through Missoula, linking Boston on the east with Seattle on the west.

Missoula is presently served by Northwest Airlines, providing east-west air travel. The Northern Pacific Railroad connects Missoula by rail with Chicago in the east and Portland-Seattle in the west. The Chicago, Milwaukee, St. Paul and Pacific Railroad also serves Missoula.

MAJOR HIGHWAY AND STREET NETWORK

The major highways and streets serving the Missoula area are shown in Figure 2. The Federal-Aid Primary Highways in the Study Area are U. S. Highways 10, 12 and 93,

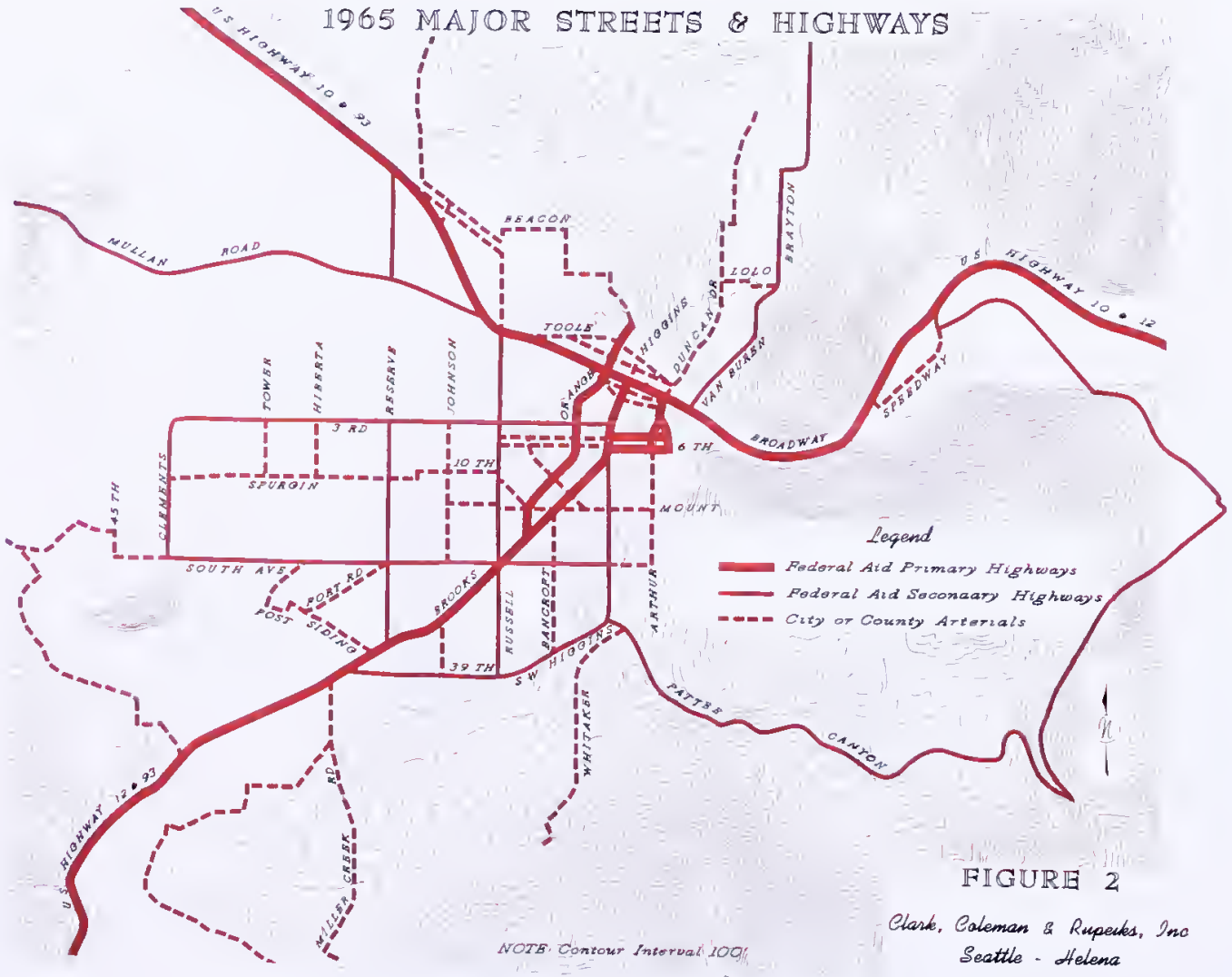

FIGURE 2

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including, within the City of Missoula, parts of Broadway, Brooks, Madison, Middlesex, Orange, Stephens, South Fifth and South Sixth Streets and Higgins Avenue. The Primary System in the Missoula Study Area has a total length of 23.4 miles, 7.8 miles of which are within the incorporated area.

The Primary Highway System includes all the high volume streets within the Study Area. The highest average weekday traffic is found on the short section of Higgins Avenue from Broadway south to Brooks Street. Broadway, which coincides with U. S. 10 and 93 west of Higgins Avenue and with U. S. 10 east of Higgins, also carries a high volume.

The Federal-Aid Secondary Highways in the Missoula Study Area have a total length of 32.7 miles, of which 7.0 miles are inside the incorporated area. Within the City of Missoula, sections of Russell, VanBuren and South Third Streets, and Higgins, South and S. W. Higgins Avenues comprise the Secondary System.

Other city and county arterials not a part of the Federal-Aid System are also shown in Figure 2. These arterials include Railroad, Spruce, Main and Front Streets in the Central Business District and Arthur Avenue, serving the University of Montana. In the Study Area, these arterials have a total length of 50.6 miles.

Together, the Federal-Aid Primary and Secondary Highway Systems and the City and County arterials form the basic street network in the Missoula Study Area. This network carries the major flows of traffic in the area, and coupled with the local and collector streets, forms the entire highway transportation system in the City of Missoula.

The present major highway and street network was conceived with consideration given to the CBD and the University of Montana, the major traffic generators. Although the general layout of the street system appears to be coherent, a discussion of vehicular volumes is necessary to evaluate street adequacy.

TRAFFIC VOLUMES

The pattern of traffic flow for the major streets and highways in the Missoula Study Area is illustrated in Figure 3. The volumes shown represent the average annual weekday traffic in 1965. They are based upon traffic counts taken by the

1965 TRAFFIC VOLUMES

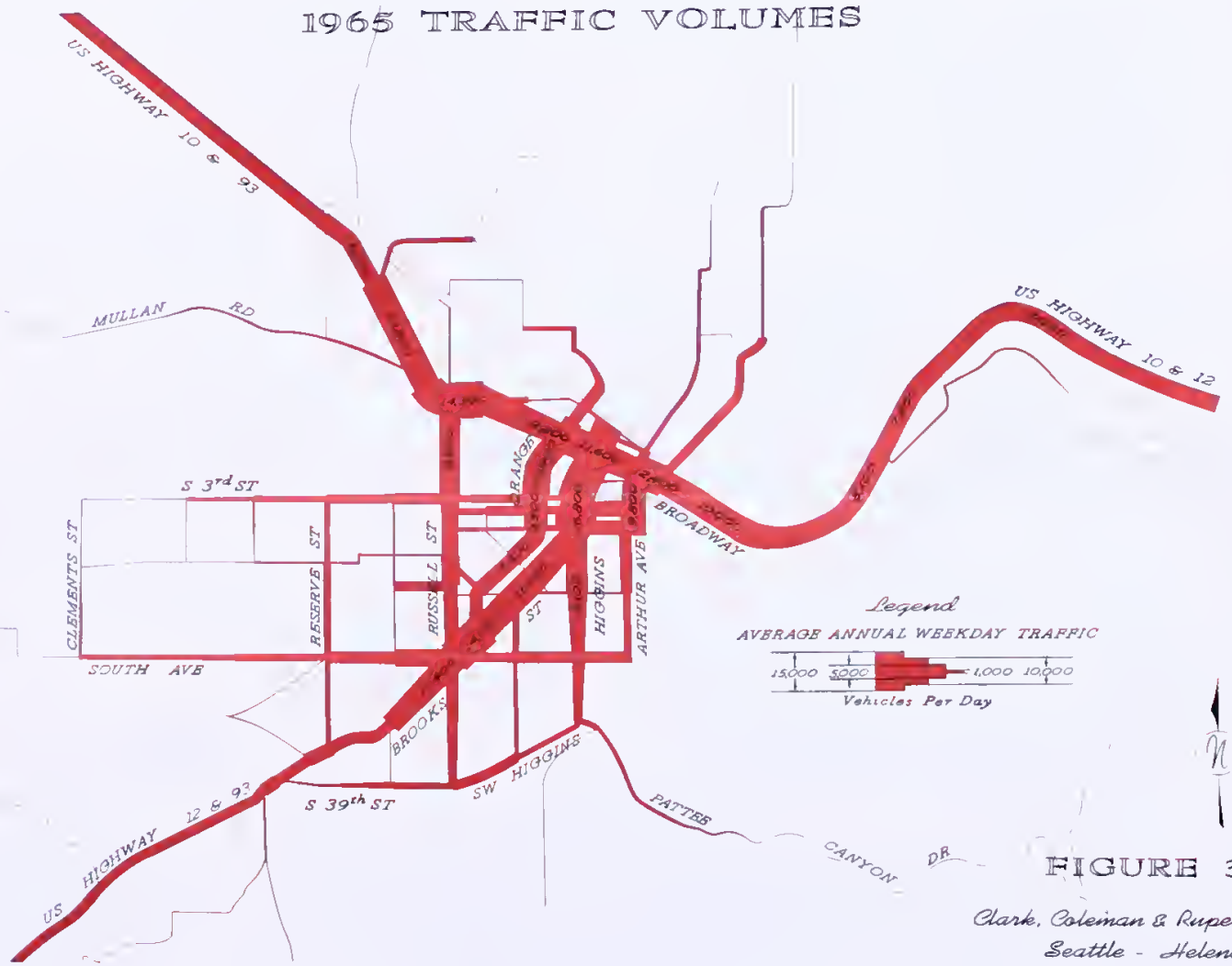

FIGURE 3

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Montana State Highway Department and an extensive program of area-wide motor vehicle volume counts conducted specifically for the Missoula Urban Transportation Study.

Heavy traffic volumes are found on streets radiating from the CBD and on the U. S. numbered highways. The highest 24-hour traffic flow is 16,800 vehicles on a short section of Higgins Avenue. Broadway is the principal east-west route, carrying in excess of 14,000 vehicles near the western city limits.

As expected, all of the high volume streets are part of the Federal-Aid Primary and Secondary Systems. The City arterial street with the highest volume is Higgins Avenue just north of Broadway, carrying an average of 7,900 vehicles daily. All other city and county arterials have average weekday traffic volumes of less than 4,100.

Traffic volumes on Missoula streets have shown a steady increase in recent years, reflecting the increase in population as well as in vehicle ownership and usage in the Missoula urban area. The increasing tourist attraction exhibited by western Montana is also partially responsible.

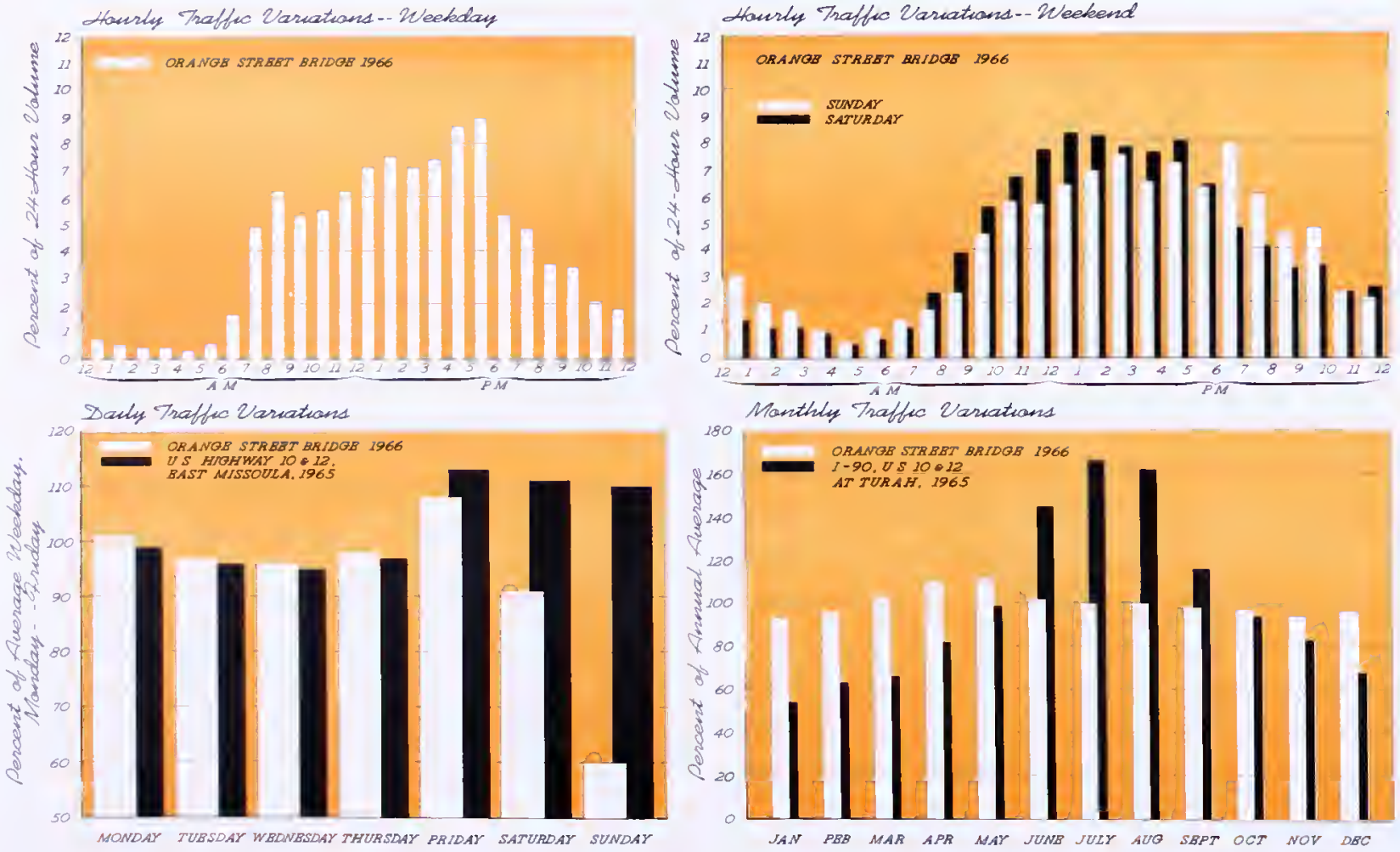
TRAFFIC VARIATIONS

Traffic flow on streets and highways follows a repeating cyclical pattern. The magnitude of traffic is related to the time of the day, day of the week and month of the year. Traffic variations are also influenced by the character of the area traversed.

Figure 4 illustrates traffic variations at two locations in the Missoula Area. The Orange Street Bridge volume variations are representative of the variations in the City, while the permanent counting station at Turah, east of Missoula, records variations in open highway traffic.

The weekday hourly traffic variation on the Orange Street Bridge clearly shows the expected morning and evening peaks. The former, occurring between 8:00 and 9:00 a.m., amounts to 6.2 percent of the day's total travel, while the latter, from 5:00 to 6:00 p.m., includes 8.9 percent of the day's total travel. A midday peak, between 1:00 and 2:00 p.m., is also evident.

The hourly traffic variation on the Orange Street Bridge is also shown for Saturdays and Sundays. The peak hour on



TRAFFIC VARIATIONS

FIGURE 4

Saturday is 12:00 noon to 1:00 p.m., amounting to 8.3 percent of the day's total travel. The total volume on Sunday is only 65 percent of Saturday's volume and is distributed more uniformly throughout the day, reaching a peak of 7.9 percent between 6:00 and 7:00 p.m.

The daily traffic variations are shown for both urban and rural locations. Friday is the peak for both areas, with 108 percent of the average weekday traffic at the Orange Street Bridge and 113 percent east of Missoula on U. S. 10 and 12. The midweek traffic variations are similar at both locations. However, the weekends show a high usage of the rural facilities, while the volumes on the Orange Street Bridge are appreciably lower.

The monthly traffic variations again show a significant difference between the two locations. At the Orange Street Bridge, the percent of annual average volume ranges from a low of 93 in January to a high of 112 in May. Only four months, March through June inclusive, are over 100 percent. At the Turah station east of Missoula, there is a much wider variation. A low of 54 percent of the annual average occurs in January, while a peak of 166 percent is reached in July. The effect of winter climate and summer tourism on travel in the rural areas is manifest.

STREET WIDTHS AND RIGHTS-OF-WAY

A summary of the inventory of major streets and highways is presented in Table II-1.

A major physical barrier to continuity in the Missoula street and highway system is Clark Fork River, which bisects the City. Four bridges cross the Clark Fork River, providing 12 lanes of traffic. The Madison Street and the Higgins Avenue Bridges both provide four lanes of travel, while the Orange Street and Russell Street Bridges each have two lanes of travel.

Adequate rights-of-way are substantially more important than the existing pavement widths in developing plans for future facilities in built-up areas. Many streets in the Federal-Aid Primary and Secondary Systems have rights-of-way in excess of 80 feet. In general, a deficiency exists in this system when the right-of-way is less than 80 feet.

TRAFFIC CONTROLS AND REGULATIONS

In an attempt to attain maximum utility from the existing street facilities, many traffic control measures have been applied in the Missoula urban area. These include traffic

TABLE II - 1

INVENTORY OF MAJOR STREETS AND HIGHWAYS

Routes	Limits	Length (Miles)	Right-of-Way (ft)	Trav'd Way Width (ft)	Travel Lanes	1965 Average Weekday Traffic
FEDERAL AID PRIMARY						
U. S. Highway 10 & 93	Butler Cr. Road to Lincoln Street	4.89	80	32	2	6,200-13,500
U. S. Highway 10 & 93	Lincoln Street to Blanche Street	0.70	113-80	30	2	12,100-14,300
U. S. Highway 10 & 93	Blanche Street to Higgins Avenue	0.55	100	44-66	4	12,000-12,400
U. S. Highway 10	Higgins Avenue to Madison Street	0.36	100	66	2-4	12,000-12,400
U. S. Highway 10 & 12	Madison St. to 1.80 miles east of Marshall Cr. Rd.	5.61	100-80	70-26	2-4	6,800-12,000
Madison Street	Broadway St. to S. Fifth	0.29	80	56-70	2-4	9,800
South Fifth Street	Madison St. Bridge to Higgins Avenue	0.40	80	44	2	6,000
South Sixth Street	Higgins Avenue to Madison Street Bridge	0.57	80	44	2	6,000

Saturday is 12:00 noon to 1:00 p.m., amounting to 8.3 percent of the day's total travel. The total volume on Sunday is only 65 percent of Saturday's volume and is distributed more uniformly throughout the day, reaching a peak of 7.9 percent between 6:00 and 7:00 p.m.

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U. S. Highway 10 & 93	Lincoln Street to Blanche Street	0.70	113-80	30	2	12,100-14,300
U. S. Highway 10 & 93	Blanche Street to Higgins Avenue	0.55	100	44-66	4	12,000-12,400
U. S. Highway 10	Higgins Avenue to Madison Street	0.36	100	66	2-4	12,000-12,400
U. S. Highway 10 & 12	Madison St. to 1.80 miles east of Marshall Cr. Rd.	5.61	100-80	70-26	2-4	6,800-12,000
Madison Street	Broadway St. to S. Fifth	0.29	80	56-70	2-4	9,800
South Fifth Street	Madison St. Bridge to Higgins Avenue	0.40	80	44	2	6,000
South Sixth Street	Higgins Avenue to Madison Street Bridge	0.57	80	44	2	6,000

TABLE II - 1 (Continued)

Routes	Limits	Length (Miles)	Right-of-Way (ft)	Trav'd Way Width (ft)	Travel Lanes	1965 Average Weekday Traffic
Russell Street	Broadway St. to S. 3rd Street	0.76	140	24-34	2	8,000- 8,500
Russell Street	S. 3rd Street to Brooks Street	1.25	73-93	40-24	2	5,600- 7,500
Russell Street	Brooks St. to S. 39th Street	1.17	73	40	2	3,150- 5,800
S. Higgins Avenue	Brooks St. to Pattee Canyon Drive	1.46	80	37-40	2	4,450- 8,300
S. W. Higgins Avenue	Pattee Canyon Drive to Russell Street	1.12	80	30	2	2,250- 3,850
South 39th Street	Russell to U. S. Highway 93	1.47	60-80	25	2	1,000- 3,850
Pattee Canyon Drive	S. W. Higgins to 3.55 miles east of S. W. Higgins Avenue	3.55	60-80	15-32	2	100- 2,300
Subtotal		32.67				
CITY AND COUNTY ARTERIALS						
Grant Cr. Road	Raser Dr. to cordon line	2.79	60	20	2	200

TABLE II - 1 (Continued)

Routes	Limits	Length (Miles)	Right-of-Way (ft)	Trav'd Way Width (ft)	Travel Lanes	1965 Average Weekday Traffic
Lincoln Street	Broadway St. to Turner St.	0.55	80-115	30	2	1,000
Lincoln Street	Turner St. to U.S. Highway 10 & 93	1.10	80	30	2	100- 200
Raser Dr.-Otis St.-Lincoln St.-Scott St.-Turner St.-Worden St.	Grant Cr. Road to North 5th Street	2.81	80	24-36	2	300- 2,400
VanEvan Crossing	U.S. Highway 10 & 93 to Raser Drive	0.23	60	24	2	2,000- 2,200
Toole Avenue	Broadway St. to Railroad Street	0.68	80-113	37-48	2	850- 2,350
Railroad Street	Toole St. to Madison St.	0.72	38	16-38	2	850- 1,800
Spruce Street	Toole St. to Madison St.	1.00	100	40-60	2-4	2,000- 3,700
Duncan Drive	N.P.R.R. Tracks to North Highland Drive	1.53	30- 60	20	2	100- 2,100
Madison Street	N P.R.R. Tracks to Broadway	0.18	80	45	2	4,100
Lolo Street	Duncan Drive to Brayton Street	0.52	60	24	2	100

TABLE II - 1 (Continued)

Route	Limits	Length (Miles)	Right-of-Way (ft)	Trav'd Way Width (ft)	Travel Lanes	1965 Average Weekday Traffic
Speedway Street	U. S. Highway 10 & 93 West to E. Missoula to U. S. Highway 10 & 93 East of Missoula	1.23	60	25	2	100- 1,000
Main Street	Orange St. to Madison St.	0.59	38-66	99	2-3	2,000- 5,800
Higgins Avenue	Broadway St. to Railroad St.	0.19	99	66	4	4,000-11,800
Front Street	West Broadway St. to Madison Street	0.82	70-90	26-52	2	500- 4,900
South 5th Street	Higgins Avenue to Russell Street	1.00	80	40-45	2	3,000- 3,100
South 6th Street	Higgins Avenue to Russell Street	1.00	60	22-35	2	2,000- 2,550
South 10-11th Street	Russell Street to Reserve Street	1.00	60	24-30	2	1,000
Spurgin Road (S. 11th)	Reserve Street to Tower Street	1.12	60	21	2	400- 1,000
Spurgin Road (S. 11th)	Tower Street to Clements Street	0.87	60	19	2	400
Mount Avenue-Evans Avenue	Arthur Avenue to Russell Street	1.38	60-80	30-46	2	900- 1,400

TABLE II - 1 (Continued)

Routes	Limits	Length (Miles)	Right-of-Way (ft)	Trav'd Way Width (ft)	Travel Lanes	1965 Average Weekday Traffic
South 14th Street	Russell Street to Johnson Street	0.46	80	40	2	3,900
South Ave.-45th Street-North Ave.-Big Flat Rd.	Clements St. to cordon line	1.90	60	25	2	200- 300
Fort Road	Reserve Street to Post Siding Road	0.91	60	24	2	800
Fort Road	Post Siding Road to South Avenue	1.00	60	24-35	2	100
Post Siding Road	U.S. Highway 93 to Fort Road	0.72	60	16	2	800
County Rte. 39	U.S. Highway 93 to Big Flat Road	2.84	60	18-20	2	50- 100
Tower Street	Spurgin Road to S. 3rd Street	0.25	60	24	2	250
Hiberta Street	Spurgin Road to S. 3rd Street	0.25	60	21	2	350- 1,000
Johnson Street	South Avenue to S. 3rd Street	1.25	80	28-40	2	900- 1,000

TABLE II - 1 (Continued)

Routes	Limits	Length (Miles)	Right-of-Way (ft)	Trav'd Way Width (ft)	Travel Lanes	1965 Average Weekday Traffic
Knowles Street	Stephens Street to Russell Street	0.33	100	26-35	2	2,400
Franklin	Mount Ave.-Evans Ave. to S. 5th Street	0.87	100	25-40	2	700
Arthur Avenue	South Avenue to South 5th Street	1.61	80	40	2	3,000- 5,300
Bancroft Street	S. W. Higgins Avenue to Brooks Street	1.25	60-80	34	2	2,000- 2,800
Paxson Street	S. 39th Street to U. S. Highway 93	0.47	60	40	2	500
Whitaker Drive	Pattee Canyon Drive to Ben Hogan Drive	1.33	60	22	2	300
Lower Miller Cr. Rd. (Co. Rte. 37)	Upper Miller Cr. Rd. to E. Upper Miller Cr. Rd.	5.67	60	25	2	500
Upper Miller Cr. Rd. (Co. Rte. 37)	U. S. Highway 93 to cordon line	8.17	60	25	2	500- 1,000
Subtotal		50.59				
GRAND TOTAL		106.65				

Source: Clark, Coleman & Rupeiks, Inc.

control signals, stop and yield signs, speed control zones, curb parking restrictions and one-way streets.

Traffic control signals are in operation at 20 intersections in Missoula (see Figure 5). Three of these are fully-traffic-actuated, while the remaining 17 are either semi-traffic-actuated or have a fixed time controller. Also shown in Figure 5 are the locations of flashing beacons and school crosswalk signals.

Regulatory signing, including stop, yield and speed zone signs, is presented in Figure 5. These signs are used to inform highway users of traffic laws or regulations that apply at specific places or on certain highways. They are essential to indicate the applicability of legal requirements that would not otherwise be apparent. The stop and yield signs indicate the preferential right-of-way to be given at an intersection. The speed limit signs call the motorist's attention to the speed limit, which is 25 mph inside the city limits.

Curb parking prohibitions have been applied at numerous locations along the arterials, specifically in the CBD. Removal of curb parking permits easy access by commercial vehicles, and in some cases increases capacity by permitting more pavement width to be used by the traffic.

In general, one-way operation of a given street width is more efficient than two-way operation of the same width. Conversion of a street to one-way operation improves its traffic capacity and safety of operation. On a one-way approach, for example, left turning movements can be made more easily, due to the absence of opposing traffic. The one-way traffic street lends itself to better traffic signal progression and a minimization of pedestrian-vehicular conflicts.

One-way traffic operations have been established on two pairs of major streets in the Missoula Study Area. Front and Main Streets form a one-way couplet in downtown Missoula, while south of the Clark Fork River, South Fifth and Sixth Streets operate as a one-way pair.

STREET CAPACITY

Capacity calculations have been performed for the signalized intersections in Missoula. These calculations are based upon the generally accepted methods outlined in the

1965 Highway Capacity Manual. A level of service corresponding to a stable intersection operation, where drivers are not objectionally restricted, was assumed for the volume capacity calculations. The calculated capacities, presented in Table II-2, are compared with the 1965 AWD traffic volume by means of a volume to capacity ratio. A volume/capacity ratio greater than unity indicates that for a certain portion of the day, the intersection is operating with serious restriction to vehicular movement. During these periods, delays to vehicles approaching the intersection may be substantial, with many drivers unable to clear the intersection in one complete signal cycle.

Street capacity, as calculated for Table II-2, is dependent upon the physical characteristics of the street, of which width and intersection design are the most permanent factors. However, capacity is also affected by such variables as signal timing, turning movements, percent of commercial vehicles, parking and urban area population.

Figure 6 illustrates the capacity deficiencies at signalized intersections in the Study Area. The figure shows that some approaches of an intersection may be deficient while others are not. Some legs of an intersection may be approaching a level of deficiency. All of the deficient intersections are portrayed in individual intersection diagrams, showing the relation of volume to capacity. Areas of critical deficiency can be seen along Higgins Avenue.

TRAVEL TIME

One of the most important factors used in evaluating operating characteristics of a highway network is travel time. The time lost by motorists traveling within the city is an economic loss. For this reason, capital improvements can often be partially justified by a time saving for the motorist.

Driving time determinations were made during peak and off-peak hours. Under average conditions, it takes less than ten minutes to travel from the intersection of Higgins Avenue and Main Street to any location within the city. By means of an isochronal chart, Figure 7 shows the automobile driving times radiating from the intersection of Higgins Avenue and Main Street.

Automobile driving speeds on the major streets of Missoula range from 15 to 26 miles per hour. While driving speeds

TRAFFIC CONTROLS AND REGULATIONS

Legend

- Flashing Red & Amber Signal
- Railroad Crossing Signal
- School Crossing Signal
- Flashing Red Signal
- One-Way Streets
- Traffic Signal
- Speed Sign
- Yield Sign
- Stop Sign
- Jurisdictional Area

FIGURE 5

Clark, Coleman & Rupeiks, Inc

Helena-Seattle

TABLE II - 2

COMPARISON OF TRAFFIC VOLUME AND STREET CAPACITY

Intersection[a]	Street	Approach	Traffic Volume[b]	Street Capacity	Volume/ Capacity
Broadway-Russell Street	Russell St.	N	1,000	5,190	0.19
	Russell St.	S	8,500	12,390	0.69
	Broadway	E	14,300	16,870	0.85
	Broadway	W	13,500	13,070	1.03
Broadway-Orange Street	Orange	N	7,200	5,680	1.27
	Orange	S	9,900	7,970	1.24
	Broadway	E	12,200	10,850	1.12
	Broadway	W	10,000	9,780	1.02
Broadway-Ryman Street	Ryman	N	3,300	5,290	0.62
	Ryman	S	3,700	5,290	0.70
	Broadway	E	12,200	10,960	1.11
	Broadway	W	12,200	10.960	1.11
Broadway-Higgins Avenue	Higgins Ave.	N	11,800	8,970	1.32
	Higgins Ave.	S	15,900	8,970	1.77
	Broadway	E	11,600	8,970	1.29
	Broadway	W	12,200	8,970	1.36
Broadway-Pattee Street	Pattee Street	N	3,300	3,860	0.85
	Pattee Street	S	3,700	4,000	0.92
	Broadway	E	10,800	10,140	1.07
	Broadway	W	11,600	10,970	1.06

TABLE II - 2 (Continued)

Intersection	Street	Approach	Traffic Volume	Street Capacity	Volume/ Capacity
Broadway-Madison Street	Madison St.	N	4,100	5,460	0.75
	Madison St.	S	9,300	10,900	0.85
	Broadway	E	12,400	16,040	0.77
	Broadway	W	10,100	9,120	1.11
Higgins Ave.-Pine Street	Higgins Ave.	N	8,000	11,210	0.71
	Higgins Ave.	S	11,800	11,210	1.05
	Pine Street	E	4,000	10,500	0.38
	Pine Street	W	4,000	9,810	0.41
Higgins Ave.-Spruce St.	Higgins Ave.	N	4,000	11,210	0.36
	Higgins Ave.	S	7,600	11,210	0.68
	Spruce St.	E	2,000	12,900	0.16
	Spruce St.	W	3,700	11,890	0.31
Higgins Ave.-Main Street	Higgins Ave.	N	15,900	10,970	1.45
	Higgins Ave.	S	13,100	10,970	1.19
	Main	E	4,000	11,460	0.35
Higgins Ave.-Front Street	Higgins Ave.	N	13,100	10.970	1.19
	Higgins Ave.	S	14,700	10,970	1.34
	Front Street	W	4,850	6,140	0.79
Higgins Ave.-South 5th Street	Higgins Ave.	N	12,700	14,000	0.91
	Higgins Ave.	S	16,100	14,690	1.10
	S. 5th Street	E	6,000	4,420	1.36
	S. 5th Street	W	3,100	1,130	2.74

TABLE II - 2 (Continued)

Intersection	Street	Approach	Traffic Volume	Street Capacity	Volume/ Capacity
Higgins Ave.-South 6th St.	Higgins Ave.	N	16,100	14,690	1.10
	Higgins Ave.	S	16,800	14,000	1.20
	S. 6th Street	W	2,550	4,720	0.54
Higgins Ave.-Brooks Street-Eddy Street	Higgins Ave.	N	16,800	12,350	1.36
	Higgins Ave.	S	8,300	11,310	0.73
	Brooks Street	SW	10,600	6,150	1.72
	Eddy Street	E	Closed at Peak Hour		
Orange St.-W. Front and Main	Orange St.	N	9,900	10,100	0.98
	Orange St.	S	10,900	8,600	1.27
	Front	W	4,900	5,680	0.86
	Main	E	5,800	6,620	0.88
Orange St.-South 3rd Street	Orange St.	N	10,900	9,560	1.14
	Orange St.	S	9,500	9,560	0.99
	South 3rd St.	E	2,300	3,710	0.62
	South 3rd St.	W	3,500	3,710	0.94
Orange St.-South 5th Street	Orange St.	N	9,500	8,690	1.09
	Orange St.	S	9,400	8,690	1.08
	S. 5th Street	E	3,100	4,530	0.68
	S. 5th Street	W	3,600	4,530	0.80
Orange St.-South 6th Street	Orange St.	N	9,400	11,780	0.80
	Orange St.	S	9,300	10,870	0.86
	S. 6th Street	E	2,550	3,170	0.80
	S. 6th Street	W	2,000	3,170	0.63

TABLE II - 2 (Continued)

Intersection	Street	Approach	Traffic Volume	Street Capacity	Volume/ Capacity
Brooks St.-Middlesex	Brooks Street	NE	11,100	11,250	0.99
	Brooks Street	SW	14,000	11,810	1.19
	Middlesex	N	5,500	5,400	1.02
	Middlesex	S	1,500	7,360	0.20
Brooks St.-South Avenue	Brooks Street	NE	14,000	13,780	1.02
	Brooks Street	SW	13,200	14,190	0.93
	South Avenue	E	4,500	4,280	1.05
	South Avenue	W	6,900	7,440	0.93
Arthur Ave.-University	Arthur Avenue	N	5,300	11,760	0.45
	Arthur Avenue	S	4,500	11,250	0.40
	University	W	2,000	6,740	0.30

[a]Only signalized intersections are shown

[b]1965 average weekday traffic in vehicles per day

Source: Clark, Coleman & Rupeiks, Inc.

1965 TRAFFIC CAPACITY DEFICIENCIES

CBD INSERT

Legend

RATIO OF TRAFFIC VOLUMES TO CAPACITY

- 126 and Over
- 101 - 125
- 075 - 100
- 000 - 074 (Non-Deficient)

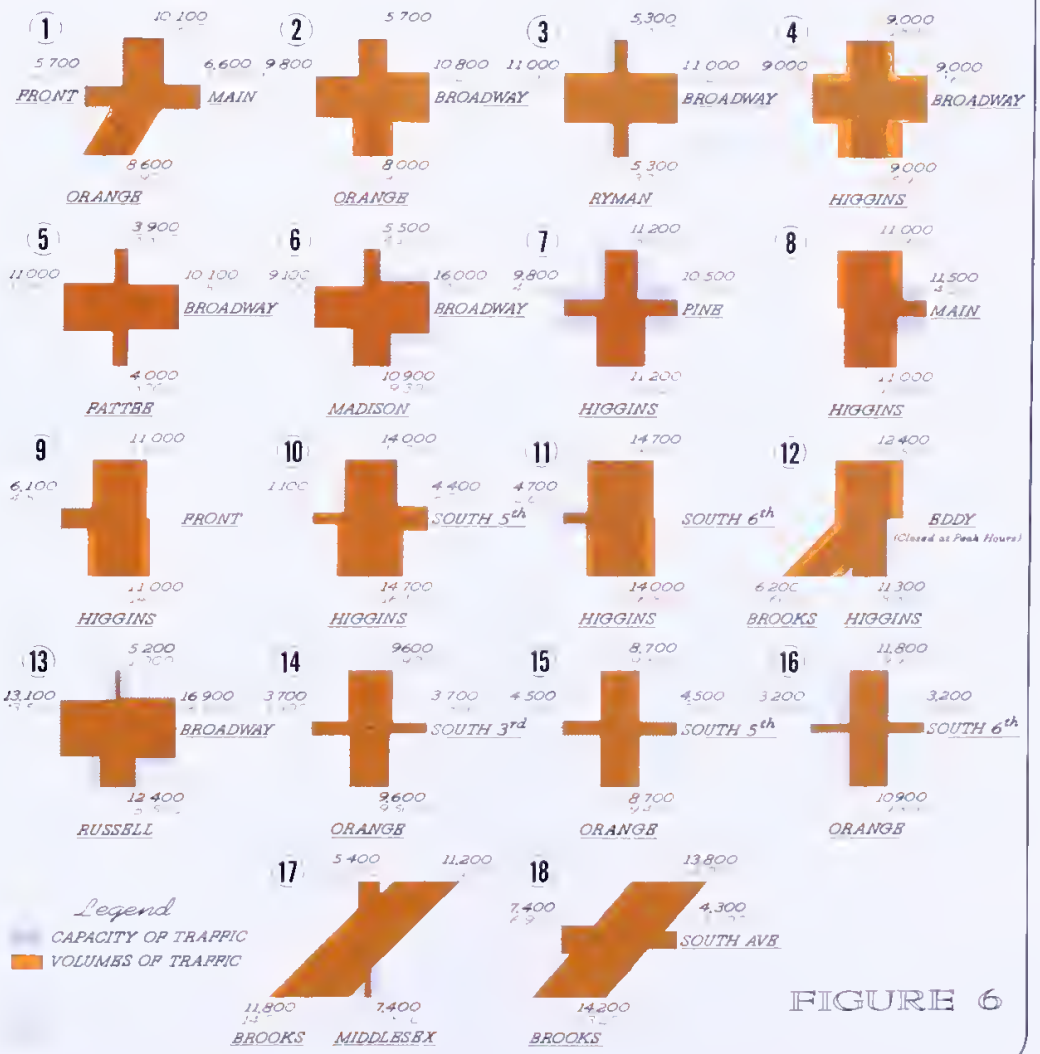

FIGURE 6

are considerably slower in the CBD, ranging from 8 to 14 mph, the freedom of operation outside the central area permits higher overall driving speeds. Within the CBD, traffic signals, parking and pedestrian conflicts at intersections are the principal causes of delay.

TRAFFIC ACCIDENTS

The urban street system should provide safe, convenient, and economical movement of people and goods. Two of the indices used to appraise the performance of a street system are frequency and severity of traffic accidents. Accidents are the result of a multiplicity of complex conditions which necessitate a detailed study of all reported accidents in the planning area before a definite pattern can be established. A thorough study will not only identify the high accident locations and permit calculation of accident involvement rates, but will also analyze such factors as seasonal variation and accident trends for the purpose of determining necessary improvements in the highway and street network.

Such a study was made of all reported accidents in the Missoula Study Area for the five-year period 1961-1965. The records of both the Missoula Police Department and the Montana Highway Patrol were used in conjunction with data gathered by the research team. Accident statistics were compiled and classified according to various parameters.

Table II-3 indicates a definite increase in the number of automobile accident injuries in the City of Missoula over the past six years. The number of fatalities in Missoula is small when compared to the statewide total and does not allow statistical inferences to be made.

The seasonal variation of automobile accidents and injuries in Missoula for the period 1961-1964 is shown in Table II-4. The months of January and December account for 24 percent of the total number of accidents while March and April include less than 13 percent. The small deviation from month to month in the number of automobile injuries is contrary to the common assumption that there are fewer injury accidents in the winter months, when vehicle speeds are limited by bad weather and poor road conditions.

The number of traffic accidents occurring on principal routes in the Study Area were summed for the three-year period, 1963-1965. Of the nearly 170 sections of streets

1965 TRAVEL TIMES

Legend

[illegible] Intersection of Higgins Avenue and Main Street

Two Minute driving time contour intervals

FIGURE 7

Clark, Coleman & Rupeiks, Inc
Seattle - Helena

TABLE II - 3

TREND IN FATALITIES AND INJURIES

Year	CITY OF MISSOULA Injuries	CITY OF MISSOULA Fatalities	Missoula County Fatalities	State of Montana Fatalities
1960	167	2	6	222
1961	162	0	11	275
1962	239	0	7	256
1963	233	1	9	228
1964	283	1	6	259
1965	336	2	25	280
1966	254	5	21	276

Source: City of Missoula and State Highway Patrol Accident Records

TABLE II - 4

SEASONAL VARIATION IN AUTOMOBILE ACCIDENTS AND INJURIES, 1961-1964

Month	Accidents	Percent of Total	Injuries	Percent of Total
January	533	11.37	76	8.29
February	352	7.51	55	6.00
March	327	6.98	63	6.87
April	272	5.81	58	6.33
May	387	8.26	79	8.62
June	374	7.98	83	9.05
July	294	6.27	69	7.52
August	377	8.05	80	8.72
September	377	8.05	90	9.81
October	412	8.79	86	9.38
November	391	8.34	91	9.92
December	590	12.59	87	9.49
TOTAL	4,686	100.00	917	100.00

Source: City of Missoula Accident Records

studied only 14 had a total of ten or more accidents. Sections of U. S. Highway 12 and 93 accounted for five of these high accident areas and four others were on Broadway which runs through the CBD. The greatest incidence of accidents for any section of street was the 35 accidents found on East Broadway between VanBuren Street and the East Missoula interchange with Interstate 90. However, this was one of the longer sections studied.

The control section length and traffic volume, combined with the number of traffic accidents, constitute more valuable information than merely the number of accidents per control section. The accident involvement rate, which is the number of accidents per million vehicle-miles of highway travel, has been calculated for the Federal-Aid Primary and Secondary systems within the Study Area. The rates, presented in Table II-5, indicate that the involvement rate on the Federal-Aid System in the Missoula Area is about three accidents for every million vehicle-miles. This compares favorably with the nationwide accident rate statistics.

An actual comparison of accident rates between cities is difficult, because of variations in accident reporting requirements. For example, in 1965, Missoula changed the regulation that all accidents in excess of $25.00 property damage be reported, to a requirement that only accidents with apparent property damage of $100.00 or more be reported. Because of this change, the number of reported accidents in Missoula dropped from over 1300 in 1964 to 750 in 1965.

Table II-6 lists the 25 highest accident locations over the period 1963-1965. The intersection with the greatest number of accidents was Higgins and Broadway, with a total of 29 accidents for the three-year period. Nearly all of the intersections with a high incidence of accidents are in or near the CBD, or on a major highway. Figure 8 shows the 25 high accident intersections, and also the location of all fatal accidents in the Study Area during the period of 1963-1965. The high volume of vehicular traffic moving within the CBD and on the major highways is a contributing factor to the high number of accidents. These 25 high accident intersections accounted for 12 percent of the injurious accidents in the City.

In summary, accident experience in the City of Missoula indicates a tendency toward more accidents in the winter months, while injury accidents are distributed more

uniformly throughout the year. The majority of high accident locations are in or near the CBD, or at intersections with U. S. Highways. The accident involvement rate in the Study Area is satisfactory when compared to national averages.

TABLE II - 5

ACCIDENT RATE, 1963-1965

	Accident Rate[a,b]	Miles Studied	National Accident Rate[a,b,c]
Federal-Aid Primary[d]			
Incorporated Area	4.56	7.85	5.01
Unincorporated Area	2.02	15.54	2.09
Subtotal	3.02	23.39	--
Federal-Aid Secondary			
Incorporated Area	3.39	6.96	4.81
Unincorporated Area	2.80	25.71	3.44
Subtotal	3.07	32.67	--
TOTAL	3.03	56.06	2.98

[a]Accident rates in this table are based on all reported accidents with personal injuries, or property damage in excess of $25.00

[b]Expressed in accidents per million vehicle-miles

[c]Accident experience on highways in 27 states, Traffic Engineering Handbook, 3rd Edition, 1965, p. 257.

[d]Excluding the freeway

Source: City of Missoula Accident Records

TABLE II - 6

HIGH ACCIDENT INTERSECTIONS, 1963-1965

	Control	Injury Accidents	Property Damage	Total
Higgins and Broadway	Signal	9	20	29
Brooks and South	Signal	12	12	24
Brooks and Middlesex	Signal	4	17	21
E. Broadway and N.P.R.R. X-ing[a]	No Control	11	10	21
Broadway and Orange	Signal	8	9	17
Orange and South Third	Signal	1	13	14
Broadway and Madison	Signal	3	11	14
Orange and Main	Signal	5	9	14
Higgins and Front	Signal	3	10	13
Broadway and Russell	Signal	4	9	13
Brooks and Roosevelt	Stop Sign	0	12	12
Catlin and South Third	Stop Sign	4	8	12
Higgins and South Fourth	Stop Sign	1	10	11
Higgins and South Fifth	Signal	1	10	11
Higgins and Pine	Signal	2	9	11
Arthur and Eddy	Stop Sign	2	7	9
Higgins and Railroad	Stop Sign	4	5	9
Orange and South Fifth	Signal	3	5	8
Higgins and Main	Signal	4	4	8
Broadway and Toole	Stop Sign	1	6	7
Higgins and South Sixth	Signal	1	6	7
U. S. Highway 93 and Miller Cr. Rd.[a]	Stop Sign	1	6	7
Broadway and Ryman	Signal	2	5	7
Higgins and Brooks	Signal	3	4	7
U. S. Highways 10, 12 and Marshall Cr. Rd.[a]	Stop Sign	5	2	7
TOTAL		94	219	313

[a]Indicates location outside city limits

Source: City of Missoula Accident Records

HIGH ACCIDENT LOCATIONS 1963-65

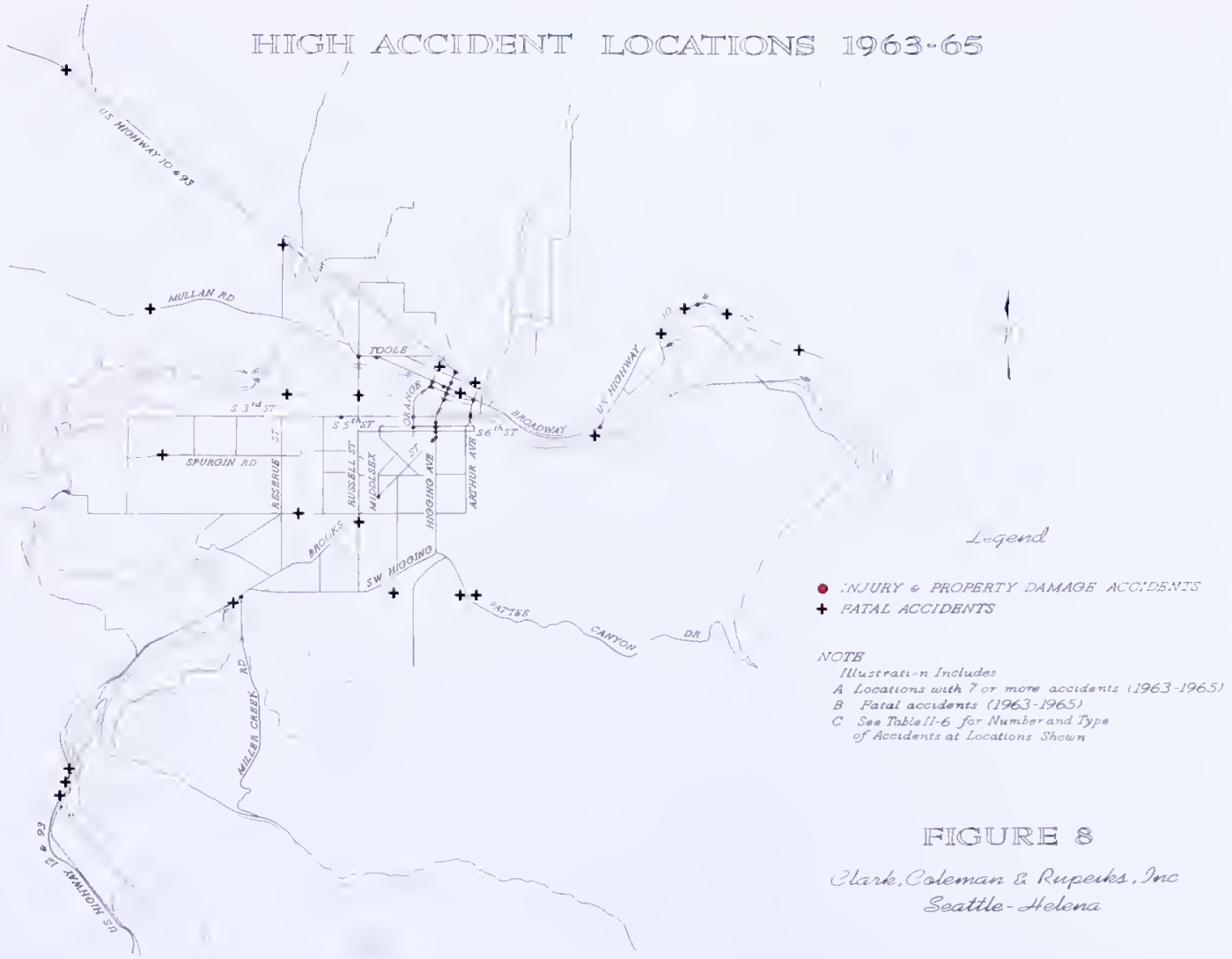

FIGURE 8

Clark, Coleman & Rupeiks, Inc
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CHAPTER 3

CHAPTER III ECONOMY, LAND USE AND COMMUNITY FACILITIES

Inventories of population and economic activity are complementary studies, essential to sound transportation planning. An understanding of size, composition and spatial distribution of the population is basic to planning for future developments. The size, composition and spatial distribution of the population are, however, greatly influenced by economic conditions such as employment and income. In turn, the population and its economic state influence the amount and types of uses of land consumed in the area. The existing spatial relationship of various land uses and community facilities, integrated by a system of arterial streets and highways is the basic building block of comprehensive and transportation plan development.

This chapter presents a brief description and analysis of current demographic, economic, land use and community facilities conditions adapted to transportation planning. Missoula's Comprehensive Development Plan treats these areas in much greater detail.

ECONOMIC FACTORS

Within Missoula City and County and within the six-county Region of which the City is the center, the forests and their products are basic to the economy. Other natural resources, however, also contribute. Mineral deposits of sand and gravel, barite, lime, gold and silver are found in Missoula County, as are these plus copper, lead, zinc and manganese in other parts of the Region. Also, the scenic environment and the recreational potential of the area are important resources for the future. Lying between two of the nation's largest parks and itself the site of over three million acres of national forest, the Region, with Missoula as its center, offers a wide variety of outdoor activities.

Although the number of farms and farmers is declining, the value of surviving farms, and of acreage and products, is increasing in Missoula County as a result of advanced technology and specialization. Agriculture is still a definite factor in the area's economy. With an emphasis

on production of lumber and wood products, manufacturing is becoming increasingly more important. That industry hired one of every seven workers in Missoula in 1960.

In its position as the core of six counties, the City of Missoula realizes an income from its retail, wholesale and service trade establishments over that available from the City population alone. The City is becoming more popular as the Regional repository for dollars spent on retail and wholesale goods, and on professional and business services. The City's economy is becoming more dependent on these sales.

Missoula is also a college town - the home of the University of Montana. The presence of the University not only affects every characteristic of the population, but provides the greatest number of jobs of any single employer in the City. Combined with previously mentioned factors, the University is a major force in the economic growth of Missoula.

Population

The six-county Region grew from 26,000 persons to more than 83,000 between 1900 and 1960, experiencing, after 1940, a higher growth rate than that of the State. Since 1960, the Region has increased by an estimated 1.6 percent annually for a population of 90,300 in 1965. Missoula County's increasing share of the Region, less than 40 percent in 1930 and more than half in 1960, displayed a trend toward centralization of population. The 9,100 persons added in the County were responsible for the Region's net gain. The population of Missoula County, at 44,663 in 1960, was estimated at 50,200 in 1965. Table III-1 gives the populations of the County, Region and State from 1900 to 1960.

Within Missoula County, the centralizing trend has been toward the Study Area. Between 1930 and 1960, the percent of the County population living inside the Study Area rose from 75 to 90 percent. During this period, the Study Area population increased by 23,400 while areas of the County outside the Study Area decreased in population by about 500.

The City held 90 percent of the Study Area population in 1930, but only two-thirds in 1960, showing a marked trend toward suburbanization. In the decade of the fifties, the suburban area grew by 46 percent as compared to the

TABLE III - 1

POPULATION, 1900-1960

Year	County	Region	State
1900	13,964	26,114	243,329
1910	23,596	41,917	336,053
1920	24,041	45,536	548,889
1930	21,782	51,969	537,606
1940	29,038	67,968	559,456
1950	35,493	74,266	591,024
1960	44,663	83,039	674,767

Source: U. S. Census

City's 21 percent increase. The home interview phase of the Transportation Study estimated that more than 6,800 persons have been added since 1960 for a total Study Area population of 46,430 in 1965. Table III-2 gives the growth rates of the City and the Study Area.

An influx of persons seeking to take advantage of increased employment opportunities in the Missoula area has been an important factor in Study Area population growth. In the 1950-60 decade, approximately one-fourth of the total increase was due to immigration.

TABLE III - 2

STUDY AREA POPULATION, 1930-1960

Year	City	Uninc. Area	Study Area[a]
1930	14,657	1,711	18,368
1940	18,448	4,187	22,365
1950	22,458	8,689	31,147
1960	27,090	12,669	39,759

[a]Estimates by Clark, Coleman & Rupeiks, Inc.

Source: U. S. Census

Age Characteristics and Trends. The 1960 age-sex composition of the population revealed a higher percentage of females in Missoula, probably a reflection of the presence of female college students and additional employment opportunities for women. The City also displayed a lower percentage of pre-school and school-age children in the population then either the County or Region. The percentages of males and females by age group for 1960 are

shown in Table III-3. Median age in the City was 27.5 years, as compared with 26.2 years in the County and 30.1 years in the Region.

The non-working age groups, that is, school age children and retired persons, made up the City's population gain between 1950 and 1960. The number of pre-school children increased by one-third, the number of children five through fourteen by 55 percent and the number of persons over 65 by 42 percent. The entire working age group, ages 20 to 64, gained by less than nine percent. The County's increase in this category was 22 percent, indicating a possible preference for suburban areas by the working age population.

General Characteristics. The overwhelming majority of Missoulans in 1960 were white and native-born, but showed a high rate of mobility. Nearly 45 percent had been born outside Montana; about 54 percent of persons over five had been living in Missoula less than five years. Over 9,500 people had been living in their present homes only a year at the time of the 1960 census.

In 1960, the Study Area contained an estimated 12,060 occupied housing units, of which 8,658 were in Missoula. The Transportation Study data indicated that 2,550 units had been added within the Study Area by 1965, and that an average of 3.18 persons resided in each of the 14,610 housing units. In 1960, average household size in Missoula was 2.93 persons, a low figure reflecting the large college population living in group quarters. As Table III-4 indicates, nearly 83 percent of the non-University population lived in single-family dwelling units. Another 6.8 percent occupied duplex units.

Comparison data for the City and the State are shown in Table III-5. The higher median education, smaller proportion of males in the labor force and lower fertility ratio (children born per 1,000 women) in Missoula reflect the impact of the presence of the University.

Employment

Missoula's 1960 civilian labor force, about 40 percent of the population, numbered 10,873, of whom 93 percent were employed. Due to the large number of working age men attending the University, only 67.4 percent of Missoula's males 14 years and older were part of the labor force compared to nearly 80 percent in the State. Thirty-eight percent of Missoula's women over 13 were in the

TABLE III - 3

1960 POPULATION BY AGE AND SEX

	City		County		Region	
	M	F	M	F	M	F
Under 5	4.8	5.1	5.9	5.8	5.7	5.5
5 - 14	8.9	8.8	10.0	9.9	10.3	10.1
15 - 19	5.0	5.2	4.4	4.4	4.3	4.0
20 - 24	5.3	4.1	4.2	3.9	3.2	3.1
25 - 34	5.6	5.3	6.3	6.2	5.6	5.6
35 - 44	5.5	5.8	6.0	6.0	5.9	5.7
45 - 54	5.3	5.6	5.3	5.1	5.9	5.3
55 - 65	4.0	4.5	3.7	3.7	4.2	4.7
65+	5.1	6.1	4.4	4.8	5.6	5.3
TOTAL	49.5	50.5	50.2	49.8	50.7	49.3

Source: U. S. Census

TABLE III - 4

STUDY AREA POPULATION BY DWELLING UNIT STRUCTURE TYPE, 1965

	Non-University Population	Percent	University Housing	Total Population
Trailer	1,285	3.0	--	1,285
Single-family	35,855	82.7	--	35,855
Duplex	2,949	6.8	--	2,949
3 and 4 units	1,281	3.0	99	1,380
5 - 20+ units	1,265	2.9	539	1,804
Rooming House	102	.2	--	102
Hotel	170	.4	--	170
Motel	325	.7	--	325
Institutional	135	.3	2,425	2,560
TOTAL	43,367	100.0	3,063	46,430

Source: Survey by Clark, Coleman & Rupeiks, Inc.

labor force; over one-half of these were second wage earners in their families.

In the 1950 to 1960 decade, total employment had grown by 20 percent in the City, 25 percent in both the County and the Region and less than six percent in the State. Missoula's rate of unemployment rose from 4.5 to 7.2 percent, however, contrasted with a decline in the State from 12.3 to 6.6 percent.

TABLE III - 5

COMPARISON OF POPULATION CHARACTERISTICS

	City	State
Median school years completed	12.2	11.6
Percent completing 4 years of college	7.3	3.9
Percent 15-24 years of age	19.6	13.4
Percent living in group quarters	6.3	2.6
Percent males 14 years+ in labor force	67.4	79.7
Fertility ratio	422	566

Source: U. S. Census, 1960

Occupational Structure. Owing to the presence of the University and U. S. Forest Service Headquarters, a preponderance of professional and clerical workers existed in Missoula's labor force in 1960. Of the total, professionals accounted for 17 percent and clericals 15 percent. Other large occupational groups were services and craftsmen, hiring 13 and 13.6 percent, respectively.

Employment by Major Industry. Retail trade, employing over 1,800 Missoula workers and about 2,840 County workers, was the largest industry group in 1960. The services industries employed another one-third in the City and 40 percent in the County. Educational and professional services had grown by 55 and 93 percent, respectively, between 1950 and 1960 in the County for the most rapid growth rate of major industries.

Study Area Employment. The total number of persons employed in the Study Area in 1965 was estimated at 15,200 through analysis of the Transportation Study work trip data. As the breakdown of employment in Table III-6 shows, retail trade was the largest category with over one-fifth of the total, followed by the various services with almost another one-fifth.

Over one-third of the Study Area's total employment was concentrated within the Central Business District. Nearly one-half of the services workers and 38 percent of retail trade employees worked in the CBD. Together, these categories claimed over one-half of the CBD's 5,185 workers. Employees in finance, insurance and real estate offices and in government were most heavily concentrated in the CBD; education, construction and manufacturing employment were the least centrally oriented. The three largest employers in the Study Area at the time of the survey were the University, the U. S. Forest Service and St. Patrick's Hospital with 1,750, 752 and 438 workers, respectively.

Income

The median family income in Missoula in 1959 was $5,847 and in the County, $5,769. Both had higher medians than did either the Region or the State. As Table III-7 shows, a higher percentage of families earning $10,000 a year and above lived in the City and County. Conversely, the Region and State had higher percentages of their families earning $3,000 and below. Transportation Study data showed a 1965 median family income of $6,227 in the Study Area.

TABLE III - 6

1965 STUDY AREA AND CBD EMPLOYMENT

	Study Area		CBD	
	No.	Percent	No.	Percent
Agriculture	100	.7	30	.6
Manufacturing	2,000	13.2	249	4.8
Trans., Comm., Util.	1,400	9.2	677	13.1
Construction	700	4.6	79	1.5
Wholesale Trade	525	3.4	113	2.2
Retail Trade	3,175	20.9	1,220	23.5
Fin., Ins., Real Estate	650	4.3	456	8.8
Public Administration	1,300	8.5	819	15.8
Education	2,400	15.8	90	1.7
Services and Misc.	2,950	19.4	1,452	28.0
TOTAL	15,200	100.0	5,185	100.0

Source: Clark, Coleman & Rupeiks, Inc.

TABLE 111 - 7

1959 FAMILY INCOME

	Under $3,000	$3,000-6,999	$7,000-9,999	$10,000+	Total	Median
Missoula	16.9	47.6	21.3	14.2	100.0	$5,847
County	16.4	41.7	21.4	12.5	100.0	5,769
Region	22.9	44.9	17.8	9.4	100.0	4,905
State	20.2	49.5	19.8	10.5	100.0	5,403

Source: U. S. Census, 1960

LAND USE FACTORS

The tangible elements of the population - age, education, income and others - combine with the intangibles of personal values and preferences to determine where people choose to live. The desire for profit, the efficient operation of business and the proximity of similar establishments motivate the location of commerce and industry. With some exception, these uses, residential, commercial and industrial, tend to group together by function within the limitations of the land itself. The existing development of land in the Missoula Study Area, located as it is in a natural basin surrounded by steep slopes, is discussed in this section, as are the restrictions on development levied by the setting of the area. To be kept in mind, of course, is the interrelationship of the thoroughfare network with land use and with the limitations on land development.

Physical Limitations. The City of Missoula and its urbanizing fringe, here termed the Study Area, covers a total land area of 69,517 acres. The 1965 survey taken of the Study Area revealed 10,034 acres, or 14.4 percent, in developed land, 1,128 acres, or 1.6 percent, in water areas, and the remaining 58,355 acres, 54.3 percent, in vacant land. Of the vacant land, 27,744 acres, located mostly to the north and west of the City, are marginal land with slopes in excess of 25 percent; 3,930 acres, on both sides of the Clark Fork River below the Russell Street Bridge, are marginal land susceptible to flooding. The currently vacant land suitable for development comprises 26,681 acres, 38.4 percent of the Study Area, and is located largely to the south and west of Missoula with smaller amounts near East Missoula and along Rattlesnake Creek.

Uses of Land. The results of the 1965 land use survey are shown graphically in Figure 9 and listed in Table III-8. Twenty-six percent of the total developed land, 2,619 acres, is shown in residential use. Single-family units, of course, dominated this use with 2,411 acres, 92.2 percent of residential land. As the figure shows, this type of use is found throughout the Study Area in varying degrees of density depending upon proximity to the center of the City. Multi-family use accounted for nearly 96 acres, 3.6 percent of the total, and was found mainly in and around the CBD and near the University. Less than one percent, 25 acres of residential land, was

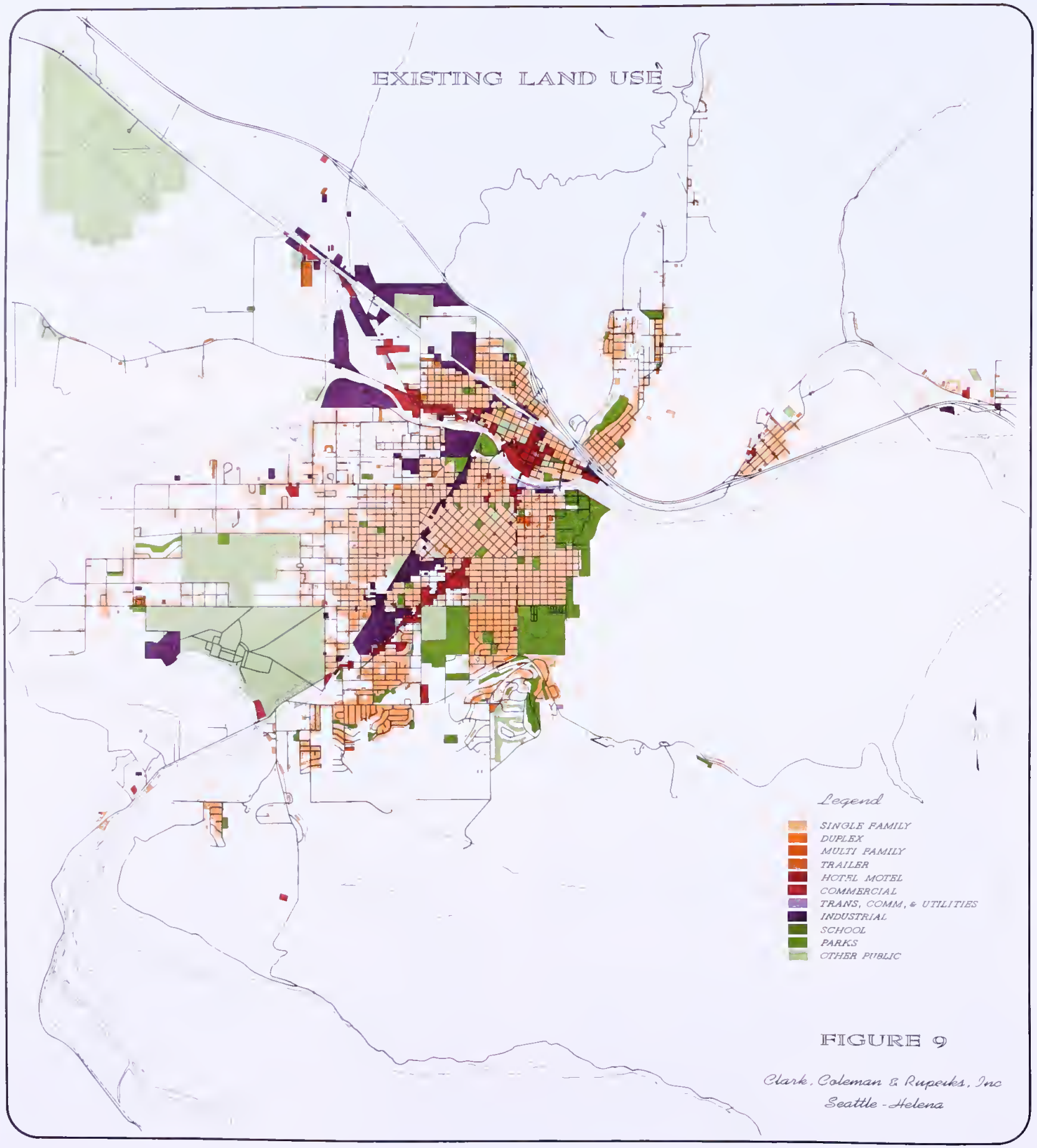


FIGURE 9

Clark, Coleman & Rupeiks, Inc
Seattle - Helena

TABLE III - 8

1965 LAND USE

	Land Area Acres	Percent of Developed Land	Percent of Total Land
Residential	2,619	26.1	3.76
Single-family	2,411	24.0	3.47
Duplex	45	.5	.06
Multi-family	51	.5	.07
Hotels, motels	25	.2	.04
Mobile homes	87	.9	.12
Non-residential	4,657	46.4	6.70
Commercial	316	3.1	.45
Manufacturing	600	6.0	.86
Trans., Comm., Util.	499	5.0	.72
Public (incl. schools)	3,242	32.3	4.67
Streets and alleys	2,759	27.5	3.97
TOTAL	10,035	100.0	14.43

Source: Survey by Clark, Coleman & Rupeiks, Inc.

used by transient accommodations and 3.3 percent, 86.6 acres, by mobile home parks. The latter was found generally west and southwest of Missoula and in East Missoula.

Nearly 316 acres of the Study Area were found to be in commercial use, or 3.1 percent of developed land. Only 51 acres, 16 percent of that in commercial use, were located in the CBD. Along Highways 10 and 93 were found another 47 percent, or about 150 acres. Approximately seven acres were in East Missoula.

Eleven percent of developed land, nearly 1,100 acres, was occupied by industry; more specifically, 600 acres in manufacturing and 499 acres in the lighter industrial usage of transportation, communications and utilities. In the latter category, railroad and power line rights-of-way account for a large share of the total acreage.

COMMUNITY FACILITIES

The citizen who gives tax support to his community expects that certain services will be rendered by the recipient of his tax dollar, among them an education for his children and protection for his home. Further, he would like to use a library and parks or recreational facilities to spend leisure hours. But the administration of these services requires support, too, in the form of a City Hall, a fire station, a police department, school buildings and land for parks. As a whole, these services, shared by all citizens, are referred to as community facilities, and their existence and locations are of importance to transportation and thoroughfare planning. Figure 10 shows the community facilities found in the Study Area in 1965.

Schools. The Study Area is comprised of five primary school districts, serving grades one through eight, and one secondary district, administering grades nine through twelve on a County-wide basis. The 1965 enrollment for all districts and all grades in the Study Area was 10,216 pupils. The breakdown of enrollment by district and type of school is shown in Table III-9.

The 22 primary schools occupy a total of 90 acres, at an average of four acres per school. The five primary districts have a total enrollment of 7,203 pupils; the largest, District One, enrolls 6,456 of these. There are a total of 270 primary classrooms with an average density of 26.7 children each.

EXISTING COMMUNITY FACILITIES

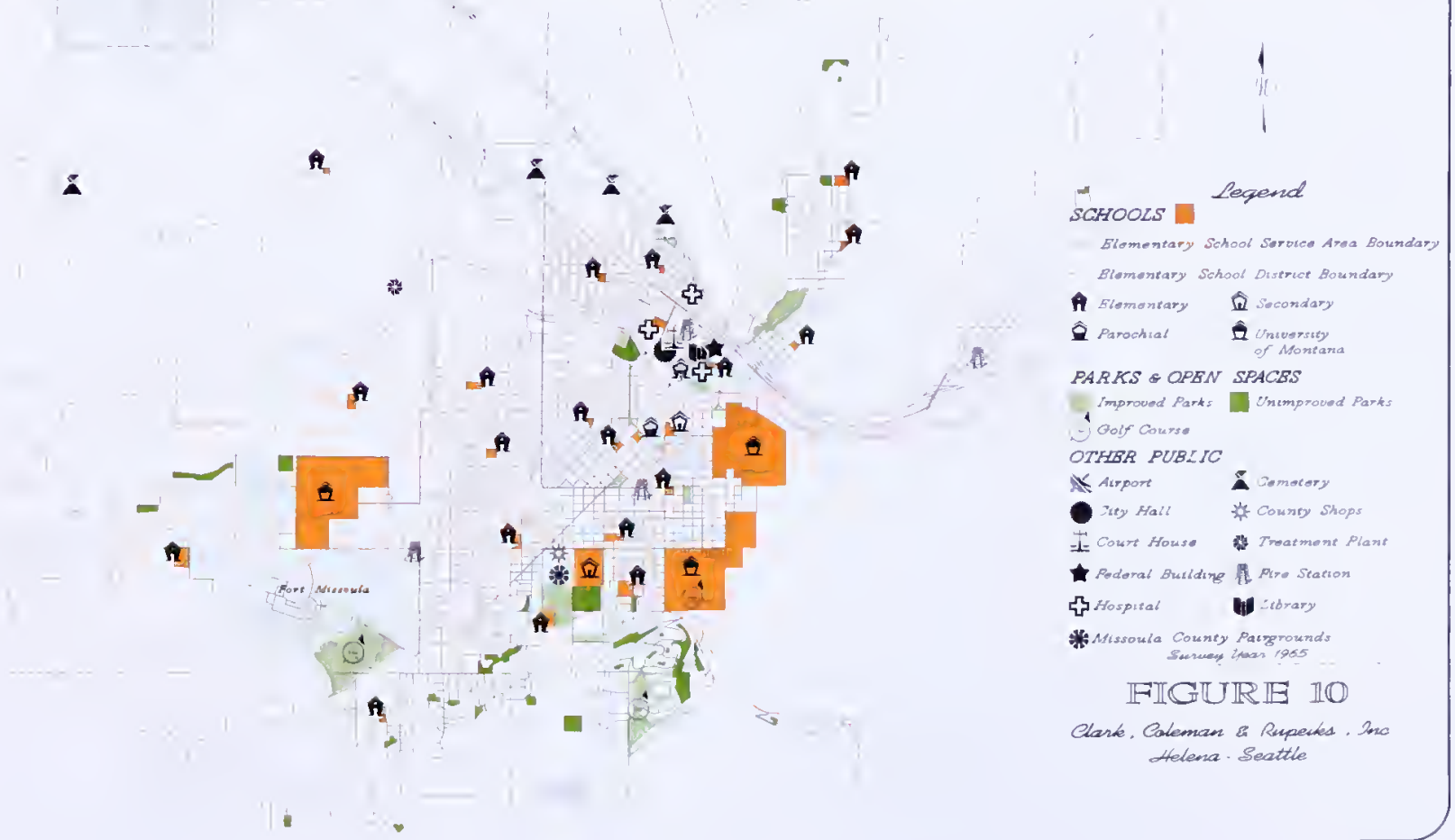


FIGURE 10

Clark, Coleman & Rupeikis, Inc
Helena · Seattle

At the secondary level are Hellgate and Sentinel High Schools, together enrolling 3,013 pupils taught in 118 classrooms. The two schools occupy 53.4 acres of land, all but three of which are at Sentinel.

Parks and Recreation. The 1965 Study Area contained 219 acres of land developed in public parks and recreational facilities. Outside the City, the only developed acreage is the 47 acre County fairground site. Twenty-nine parcels, ranging in size from the one-tenth of an acre triangle at Front and Main Streets to the fairgrounds, comprise the Study Area's developed park and recreational acreage. Several undeveloped parcels, resulting from the State statute requiring that one-ninth of a platted area in excess of 20 acres and one-twelfth of a plat of less than 20 acres be dedicated for public park and playground use, have not been included here. Figure 10 gives the location of developed and undeveloped park and recreation sites.

Approximately 76.8 acres of net open play area are located on primary and secondary school grounds in the Study Area and should be included as recreational land. Private recreational facilities include three golf courses, near Fort Missoula, in the Highlands and on the University of Montana campus. All three are available to the public.

Other Public Facilities. The City of Missoula is served by three fire districts: the City of Missoula Fire Department, the Missoula Rural Fire District and the East Missoula Fire District. The City Fire Department, the largest, has two facilities, the headquarters at 200 West Pine Street and the substation at 247 Mount Avenue. The Rural Fire District, serving the area south and west of the City, is located at 2522 South Avenue. The East Missoula Fire District, a volunteer department, is located on the corner of Third and Speedway Streets.

The Missoula County Library, constructed in 1903, contains 3,200 square feet of floor area and an operating stock of 83,092 books. Branch facilities are found in Bonner, Milltown, Clinton, Seely Lake, Frenchtown, Potomac, Orchard Homes, Swan Valley and Cold Springs. Increased circulation and small building size have combined to render the present facility functionally inadequate.

The Missoula City Hall, constructed in 1910, is located at 230 Woody Avenue. The structure, containing only 5,966 square feet of floor area, houses administrative offices, the Police Department and the jail. The City Hall is inadequate in terms of both structure and function, and consideration has been given to a new facility and site, but no location has yet been approved.

TABLE III - 9

EXISTING SCHOOL FACILITIES

		Number of Classrooms	Average Pupils Per Classroom	Total Site Acreage
Elementary Schools				
District # 1 -	18	237	27.2	64.6
14 -	1	11	29.7	4.8
20 -	1	2	14.0	.9
4 -	1	8	16.6	2.0
23 -	1	12	24.0	18.6
Subtotal	22	270	26.7	90.0
Secondary Schools	2	118	25.5	53.4
TOTAL	24	388	26.3	144.3

The Missoula County Courthouse, constructed in 1908, has 24,640 square feet of floor area. Here, too, overcrowding is considerable, but completion of the annex now under construction is expected to alleviate some of the space problems. A new jail and the Sheriff's Department will also be housed in the annex.

The Study Area is served by the modern facilities of the Missoula County Airport, covering about 1,200 acres to the northwest of the City. Completed in 1950, the Terminal Building houses offices for Northwest Orient Airlines, the Federal Aviation Agency, the Weather Bureau and a restaurant. The longest runway measures 7,100 feet and is capable of handling short to medium range jet airliners. During 1965, the airport handled 21,408 passengers and 205,356 pounds of cargo. Automobile parking is ample, with over 100 spaces reserved adjacent to the terminal, and charter flights, flight school, storage, fuel, maintenance and small storage hangars for private owners are available. Next to the airport is the United States Forest Service Smoke Jumpers School which jointly uses runway facilities.

CHAPTER 4

CHAPTER IV TRAVEL SURVEYS

Basic data on travel patterns are necessary to understand the manner in which travel develops in an area. Travel surveys are designed to collect this data, which subsequently can be summarized and combined with other information to provide insight into the nature of travel.

In the Missoula Study Area, data on trips were collected in three types of travel surveys. These surveys were later integrated to form an overall picture of total travel. The home interview survey, the truck-taxi survey and the external survey are discussed in this chapter. Special attention is given to survey procedures and accuracy checks.

HOME INTERVIEW SURVEY

Within the Missoula Study Area boundaries, a sample of one out of every five households was selected for inclusion in the home interview survey. To select this sample, the 1965 edition of Polk's City Directory for Missoula was used. For that part of the Study Area covered by this directory, one out of every five households was selected from the Directory listings. In those areas not covered by the Directory, standard field procedures were used to select every fifth house.

From the selected sample of 3,052 households, 2,644 completed interviews were obtained. The 408 incompleted interviews were due primarily to vacancy, no response from the resident and commercial usage.

The home interview survey commenced on August 23, 1965 and continued until November 19, 1965. Data collection procedures were organized by assigning a schedule of selected households to each interviewer. The interviewer, whose visit was preceded by a pre-interview letter explaining the purpose of the survey, recorded the information supplied by one or more residents of the household.

Each interview obtained data for a particular travel date. Travel date is defined as the 24-hour period ending at 4:00 a.m. on the day of the interview. The interviewer collected general information such as the type of structure

occupied by the respondent, the household size, the number of automobiles owned and the total household income.

Specific information was collected about travel on a trip-by-trip basis. For the purpose of this study, a trip was defined as a one-way journey between two points by a person five years of age or older.

Information describing the trip maker was also obtained. This included personal identification as well as data on age, sex, race, occupation and industry. Questions regarding both the origin and destination of trips, including the land use at these locations were also asked. The time of day at which the trip took place and the purpose of the trip were recorded. Finally, the interviewer requested information on the mode of travel utilized. If the mode was automobile, data on number of passengers and type of parking used were collected.

In the home interview survey, data were collected on all trips made by persons five years of age or older with the following exceptions: trips with both the origin and destination outside the Study Area and trips by drivers of a commercial vehicle. The home interview survey recorded all other trips within the cordon boundary, including trips having only one end within the area.

TRUCK - TAXI SURVEY

The truck-taxi survey is designed to collect data on the travel movements of commercial vehicles. To sample vehicles for the truck-taxi interviews, a listing of 1965 truck tabs was obtained from the Missoula County Assessor's office. There was a total of 6,200 tabs issued as of August, 1965. Using these tabs, a list of random numbers for the range 1-6,200 was obtained by the computer. From this list, interview samples were selected. Only those registration tabs listing an address within the Study Area or having a post office box number or rural route number were accepted. From this universe, 1,000 samples were selected.

Of the total sample number, there were 643 completed interviews and 357 non-interviews. Reasons for non-interviews included refusal to answer, truck junked with no replacement, unable to locate and vehicle outside of the area on the interview date.

The driver of the vehicle was mailed a pre-interview letter explaining the survey and a form on which he was asked to record the origin and destination of all trips on his assigned day and also the time at which the trips began and ended. Information on land use and trip purpose was also requested. Additional data, including type of vehicle, were obtained during the follow-up interview on the day after the recorded travel date. These interviews were conducted between August 23 and November 5, 1965.

Because of the small number of taxis and school buses, it was possible to obtain 100 percent coverage of these vehicles. The interview procedures for these vehicles were otherwise identical with the truck survey.

Like the home interview survey, the truck-taxi survey included trips crossing the cordon boundary. These were deleted from the truck-taxi file to avoid duplication of information from the external survey.

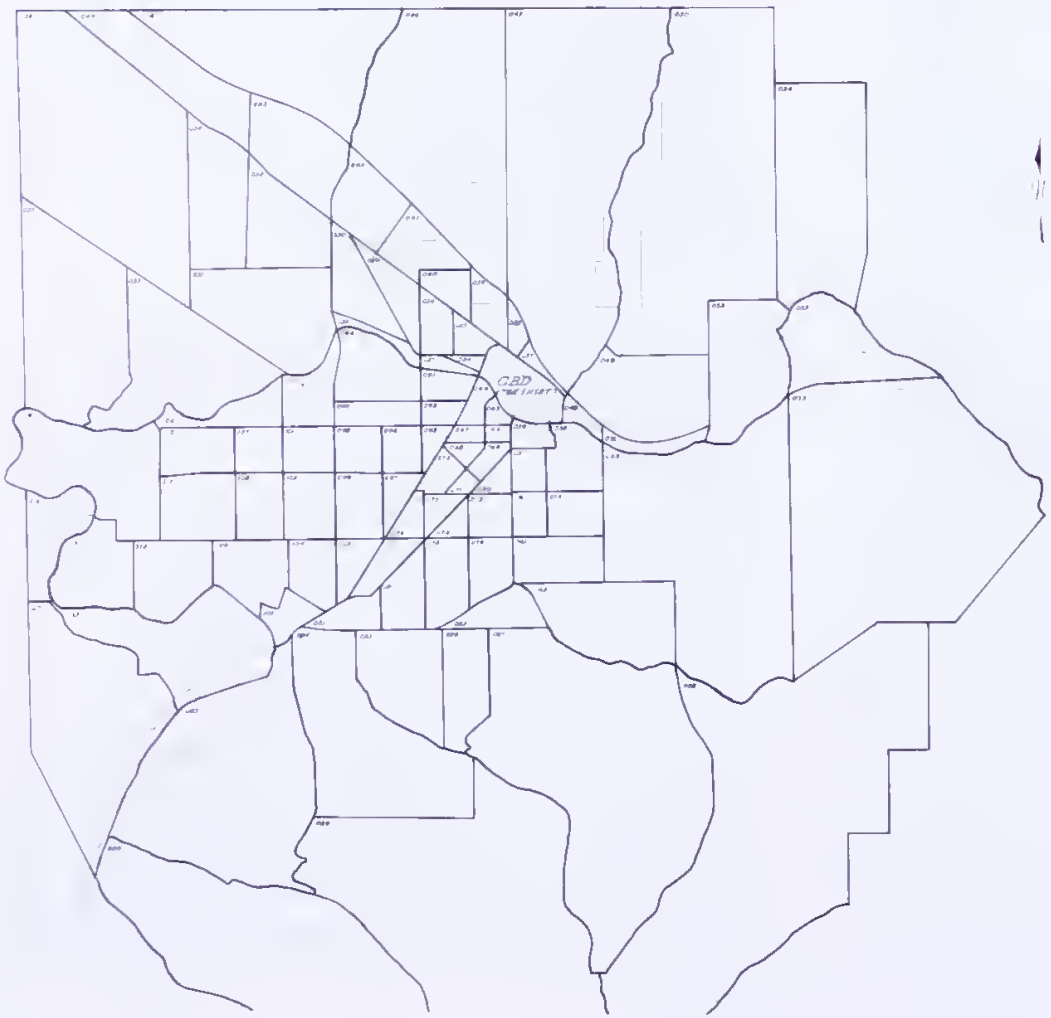
EXTERNAL SURVEY

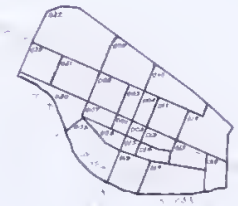
Some vehicular trips pass through the area or have one trip end inside the Study Area. For the purpose of intercepting and collecting data from as many of these trips as possible, an external survey was conducted. Interview stations were established on most roads which cross the Study Area boundary and traffic passing in both directions was halted and questioned. The interview stations for the Missoula Study Area are shown in Figure 11. More than 95 percent of the traffic across the cordon boundary was carried on the routes past these stations.

In the external survey, trips across the boundary are recorded regardless of whether the trip is made by an area resident or not. Trips made by residents are statistically included in the home interview survey. These trip duplications are deleted from the home interview survey, because the external survey is usually accorded a higher degree of reliability than the home interview.

Through trips, defined as those trips where no stops are made in the Study Area, or only a casual stop at a restaurant or service station, are counted twice by the external survey. That is, they are counted both entering and leaving. In the analysis of travel, however, the twice recorded through trips are reduced to one.

TRAVEL SURVEY ZONES





CENTRAL BUSINESS DISTRICT

Legend

023 Zone Number

Zone Boundary

SCALE

0 1 2 3 4 5 6

Thousands of Feet

FIGURE 11

Clark, Coleman & Rupeiks, Inc

Helena - Seattle

The external survey was conducted from August 23 to September 8, 1965.

ACCURACY CHECKS

A good deal of time and money is expended in collecting a mass of data on travel. Unless the data collected are accurate and complete, however, the results will be biased and the expenditure largely wasted. In an effort as massive and complex as a transportation study, the possibility of error exists. Thus, one of the first things to be done with data collected on travel is to run a series of accuracy checks.

The accuracy checks involve a comparison of selected items of data obtained by sample interviews with reliable independent estimates of the same information from other sources. If the comparisons show close correspondence, it is reasonable to expect that the data collected in the travel surveys are reliable.

A check was made to determine if the total 3,052 home interview samples were reasonably evenly distributed over the three month survey period. Table IV-1 indicates the number of assigned samples for each of the 13 weeks of interviews. The number of assigned samples were kept somewhat lower for the first three weeks to permit on-the-job training of interviewers. During the last week of the survey, the transient and University of Montana housing units were sampled for interview, resulting in a slightly higher number of assigned samples.

An additional check was made to determine if the 3,052 home interview samples were well distributed among the days of the week, Monday through Friday. Table IV-2 indicates the number of assigned samples for each of the five weekdays. The results indicate a reasonable distribution of survey data collection over the five weekdays.

Screenline Accuracy Check

The Study Area was divided into two parts by an east-west screenline along the Clark Fork River. The screenline had five crossing points, the four river bridges in Missoula and one crossing by a low traffic volume county road. The traffic volumes crossing the screenline were counted mechanically at regular intervals of two to five

TABLE IV - 1

HOME INTERVIEW WEEK SUMMARY

	Assigned Samples	Complete Interview	Non-Interview	Total Trips
Aug. 23 - 27	186	146	40	1,820
Aug. 30 - Sept. 3	189	160	29	1,930
Sept. 6 - 10	163	132	31	1,412
Sept. 13 - 17	222	192	30	2,131
Sept. 20 - 24	244	211	33	2,286
Sept. 27 - Oct. 1	239	208	31	2,193
Oct. 4 - 8	267	242	25	2,645
Oct. 11 - 15	251	226	25	2,038
Oct. 18 - 22	251	221	30	2,446
Oct. 25 - 29	243	218	25	2,441
Nov. 1 - 5	249	213	36	2,128
Nov. 8 - 12	202	172	30	1,584
Nov. 15 - 19	346	303	43	1,346
TOTAL	3,052	2,644	408	26,400

Source: Clark, Coleman & Rupeiks, Inc.

days over the entire survey period. Traffic volumes were also counted and classified manually for a 16-hour period on all the crossings. Screenline traffic volumes were adjusted to represent the conditions occurring at the end of September and the beginning of October, 1965, the midpoint of the home interview and the truck-taxi surveys. The average weekday hourly traffic volumes crossing the screenline by point of crossing are shown in Table IV-3.

The total traffic volume crossing the screenline during the 24-hour period on an average weekday at the midpoint of the survey period was 49,432 vehicles, while the 16-hour volume, recorded between 6:00 a.m. and 10:00 p.m., was 45,612 vehicles.

TABLE IV - 2

HOME INTERVIEW DAY OF WEEK SUMMARY

	Number of Days	Assigned Sample	Complete Interview	Non-Interview	Total Trips
Monday	12	597	534	63	5105
Tuesday	13	596	530	66	5181
Wednesday	13	676	582	94	5562
Thursday	12	590	491	99	4618
Friday	13	593	507	86	5934
TOTAL	63	3052	2644	408	26400

Source: Clark, Coleman & Rupeiks, Inc.

TABLE IV - 3

24-HOUR SCREENLINE SUMMARY

	Russell	Orange	Higgins	Madison	CR - 46	Total[a]
12:00 p.m.	103	94	116	59	1	373
1:00 a.m.	78	70	83	44	1	276
2:00	65	50	58	24	0	197
3:00	35	36	35	14	0	120
4:00	50	43	46	27	0	166
5:00	95	83	74	49	1	302
6:00	312	222	177	130	0	841
7:00	632	692	889	723	2	2,938
8:00	543	698	803	529	4	2,577
9:00	424	592	732	436	1	2,185
10:00	463	658	871	549	6	2,547
11:00	536	765	983	786	4	3,074
12:00 noon	582	857	1,071	803	2	3,315
1:00 p.m.	545	884	1,118	736	3	3,286
2:00	558	848	1,090	733	6	3,235
3:00	672	956	1,299	870	3	3,800
4:00	903	1,149	1,454	1,284	4	4,794
5:00	835	1,041	1,229	990	5	4,100
6:00	553	666	948	555	4	2,726
7:00	459	588	886	501	9	2,443
8:00	335	435	848	390	8	2,016
9:00	319	358	715	338	5	1,735
10:00	269	277	544	270	4	1,364
11:00	211	197	456	154	4	1,022
TOTAL	9,577	12,259	16,525	10,994	77	49,432

[a]Includes passenger vehicles, trucks and taxis

Sources: Clark, Coleman & Rupeiks, Inc.; Montana State Highway Department

The vehicle trip data gathered in the home interview and truck-taxi survey were expanded to reflect average weekday travel for the survey period in 1965. The vehicle trip data obtained in the external interview survey were modified to represent the average weekday travel for the period including the end of September and the beginning of October, 1965. The vehicle trips recorded in the home interview and truck-taxi survey which were counted in the external survey were removed from the internal survey data to avoid duplication. Expanded vehicle trip data obtained from the three basic travel surveys were then summarized to show the number of passenger vehicle and truck trips crossing the screenline for each hour of the day between 6:00 a.m. and 10:00 p.m. The number of vehicle trips obtained from the summary was compared on an hour-to-hour basis with the independently obtained actual traffic counts on the screenline crossings. Table IV-4 presents this comparison. A ratio of the total expanded survey data to the ground counts indicates that, for the 16-hour period, the two methods of survey agree with each other within seven percent, which is considered a good correlation. The 16-hour ratios are 0.91 and 1.03 for the passenger vehicles and trucks, respectively. Figure 12 shows the 16-hour screenline comparison.

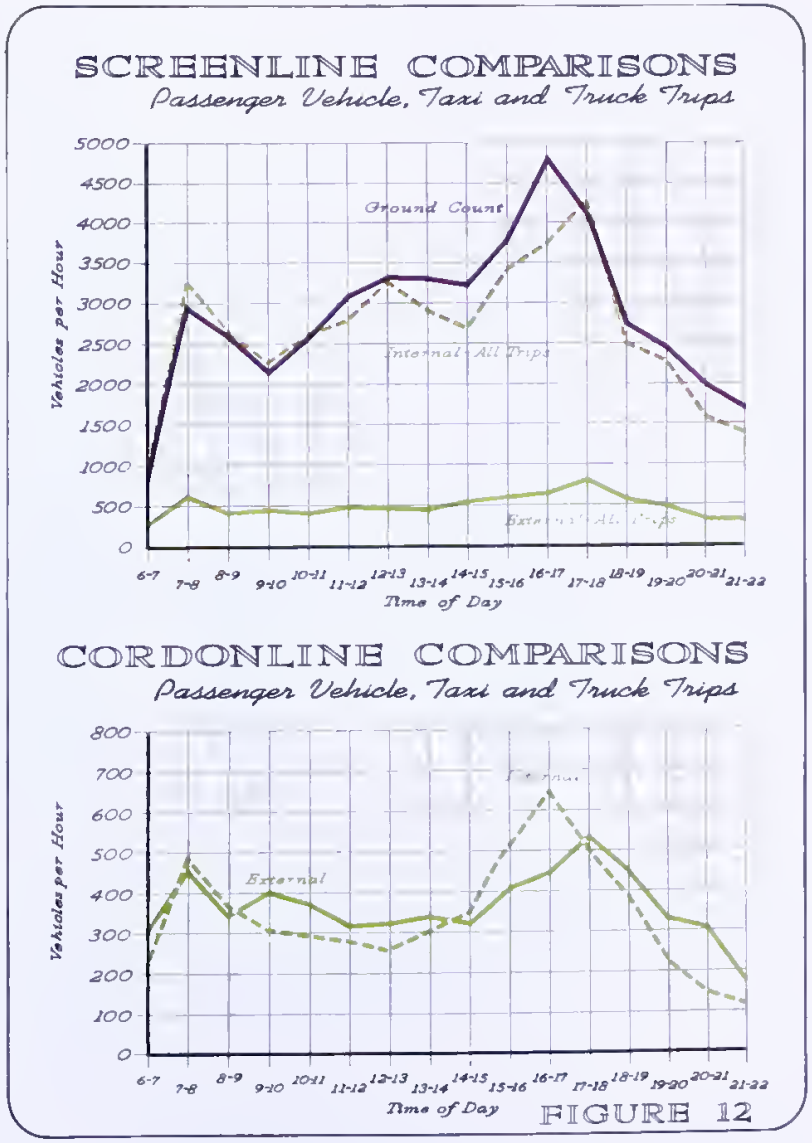


FIGURE 12

TABLE IV - 4

SUMMARY OF ALL VEHICLE TRIPS CROSSING THE SCREENLINE

Hour Beginning	Expanded Data[a] Internal	External	Total	Ground Counts[b]	Ratio
6:00 a.m.	664	249	913	841	1.08
7:00	2,689	601	3,290	2,936	1.12
8:00	2,205	426	2,631	2,573	1.02
9:00	1,823	429	2,252	2,184	1.03
10:00	2,100	482	2,582	2,541	1.02
11:00	2,425	446	2,871	3,070	0.94
12:00 noon	2,803	450	3,253	3,313	0.98
1:00 p.m.	2,449	449	2,898	3,283	0.88
2:00	2,175	528	2,703	3,229	0.84
3:00	2,832	581	3,413	3,797	0.90
4:00	3,078	642	3,720	4,790	0.78
5:00	3,521	761	4,282	4,095	1.04
6:00	1,880	589	2,469	2,722	0.91
7:00	1,783	482	2,265	2,434	0.93
8:00	1,236	335	1,571	2,008	0.78
9:00	1,070	322	1,392	1,730	0.80
TOTAL	34,733	7,772	42,505	45,546	0.93

[a]Includes passenger vehicles, trucks and taxis

[b]Does not include 16-hour total of 66 vehicles crossing on County Road 46

Sources: Clark, Coleman & Rupeiks, Inc.; Montana State Highway Department

It is important to note the time difference between the evening peak hour as recorded by the expanded travel data and the ground counts. The former indicates that the evening peak hour is between 5:00 and 6:00 p.m., while the latter suggests that the evening peak hour is between 4:00 and 5:00 p.m. This apparent discrepancy is caused by the tendency of survey respondents to generalize and report trip starting times on full hours.

In most cases, trucks registered outside the Study Area but operating within will not be included in the sample. Also, some government trucks such as mail trucks were not included. These factors affected the expanded travel data ground counts comparison for trucks.

The results of the screenline tests establish that confidence can be placed in the study's travel data as accurately portraying vehicle trip making in the Study Area. A comparison of 0.85 or better of the travel data to ground counts is generally considered satisfactory.

External Survey Accuracy Check

Trips crossing the cordon line gathered in the home interview survey were compared with cordon line crossings by area residents as determined by the external interview survey. The surveys provide two independent estimates of such trips. The comparison of these trip volumes assures the consistency of the findings of the two surveys. The home interview survey yielded a total of 5,396 such trips while the external interview survey showed a total of 5,834 vehicle crossings of the cordon line by area residents. The two surveys are within eight percent of each other. Table IV-5 presents 16-hour comparison of the expanded internal crossings to the expanded external crossings. This information is shown graphically in the cordon line comparisons, Figure 12. The ratio of the former to the latter ranges from a low of 0.47 between 8:00 and 9:00 p.m. to a high of 1.38 between 4:00 and 5:00 p.m. During the 16-hour period, the ratio for passenger vehicle trips is 0.94, while the ratio for truck trips is 0.89.

The results of the cordon line tests verify the confidence placed in the study's travel data as correctly representing vehicle trip making in the Study Area. A check within 15 percent is generally considered satisfactory for data from such surveys.

TABLE IV - 5

TOTAL TRIPS CROSSING CORDON LINE

Hour Beginning	Expanded Internal[a]	Expanded External[a]	Ratio
6:00 a.m.	210	298	0.70
7:00	488	458	1.07
8:00	368	346	1.06
9:00	303	400	0.76
10:00	290	374	0.78
11:00	281	317	0.89
12:00 noon	258	322	0.80
1:00 p.m.	299	335	0.89
2:00	355	323	1.10
3:00	528	406	1.30
4:00	647	467	1.38
5:00	503	529	0.95
6:00	388	451	0.86
7:00	220	325	0.68
8:00	144	304	0.47
9:00	114	179	0.64
TOTAL	5,396	5,834	0.92

[a]Area residents only

Sources: Clark, Coleman & Rupeiks, Inc.; Montana State Highway Department

Employment Accuracy Check

An accuracy check can also be made on employment data. To generate an employment census, the number of work trips was extracted from the travel surveys. For those persons who make more than one trip to work, only the first trip was selected. In the home interview survey, data were collected on those who work at home or who walk to work. If the travel survey data are complete and accurate, this first work trip data should represent the sum total of all persons who go to work on a typical weekday. If the data are adjusted for absenteeism, that is, for vacations, sick leave, on strike, etc., this data should yield the number of persons employed. Based on research elsewhere, a factor of 15 percent is a reasonable adjustment to apply.

From employment security data, census data, and information from the University of Montana, an independent estimate of total employment in the Study Area in 1965 was prepared. This was compared with the expanded first work trip data. The results are presented in Table IV-6.

The first work trips fall exactly ten percent short of the independent estimate. However, approximately two-thirds of this difference is made up of a discrepancy in the employment estimate for the University of Montana. Since a large part of the home interview survey took place when the University was not in session, it follows that work trips reported at this time were well below normal employment levels. Therefore, it appears that first work trips accurately represent total employment in the Study Area.

Summary of Accuracy Checks

The accuracy checks compared expanded sample data with independent estimates of the same data. It is important to realize that even if sample data are complete and accurately reported, when expanded to represent population totals they need not equal the exact population. This is because of random variation in the sampling process. Likewise, the independent estimate of the population total is just a figure based upon relevant variables. The accuracy checks consist of a comparison between two such figures, neither of which is absolutely correct. Both estimates are subject to some indeterminant amount of error.

TABLE IV - 6

COMPARISON OF EMPLOYMENT, 1965

Employment Category	First Work Estimate	Independent Estimate	Difference
Agriculture	98	100	+ 2
Construction	561	700	+ 139
Manufacturing	1,970	2,000	+ 30
TCU	1,117	1,400	+ 283
Trade	3,713	3,700	- 13
Fin., Ins., Real Estate	695	650	- 45
Service and Misc.	2,944	2,950	+ 6
Univ. of Montana	732	1,750	+1,018
Other Education	659	650	- 9
Other Government	1,191	1,300	+ 109
TOTAL	13,680	15,200	+1,520

Sources: Clark, Coleman & Rupeiks, Inc.; University of Montana; U. S. Census

It follows that an evaluation of the accuracy checks cannot be entirely objective. There must be some degree of expert judgment. This judgment is aided by guidelines arising from the uses to which the data are to be put. Based upon accepted standards, the results of the accuracy checks justify the conclusion that the sample data are complete and representative of the population from which they were extracted.

TRAVEL SURVEY FINDINGS

The home interview survey provided data on population, number of households, number of vehicles owned and number of vehicle trips. As previously outlined, the data were expanded and compared favorably with cordon and screenline counts. The results of this survey have been utilized to obtain information on the trip generating characteristics of the Missoula Study Area. In Table IV-7, these characteristics are compared with results from the Transportation Studies in Great Falls and Billings. Although the latter studies were conducted in 1961, four years prior to the Missoula study, the characteristics are similar.

The data in Table IV-7 indicate that the number of households in Missoula is 83 percent of those in Billings and 61 percent of those in Great Falls. Among the three cities, Missoula has the least number of vehicles and vehicle trips. However, when this information is adjusted on the basis of population, Missoula has the highest number of trips per person. Missoula's low value of 1.80 persons per vehicle upholds the theory that the area has become highly automobile-oriented.

Table IV-8 presents the expanded data representing the internal and external vehicular trips in the Missoula Study Area. Over one-half of the person trips are made by the auto driver, while only about two percent are made by passengers in trucks, taxis, buses, and school buses combined. On an average day, there were 13,949 external trips having only one trip end inside the Study Area. There were also 4,275 through trips. Because the cordon line count includes both entering and exiting of a through trip vehicle, the cordon line crossing volume of 22,499 is equal to the number of external trips plus twice the number of through trips.

Both the home interview and the external survey recorded trip purpose. It is necessary to know this information if future travel patterns are to be forecast accurately. For the Missoula Study, four trip purposes were recognized:

TABLE IV - 7

SUMMARY OF TRIP GENERATING CHARACTERISTICS

	1965 Missoula Study Area	Billings[a] (1961)	Great Falls[b] (1961)
Number of households	14,610	17,568	23,815
Population	46,430	58,718	74,735
Number of vehicles owned	25,767	25,794	27,057
Vehicle trips[c]	119,924	144,788	152,053
Persons per household	3.18	3.34	3.14
Persons per vehicle	1.80	2.28	2.76
Vehicles per household	1.76	1.47	1.14
Trips per person	2.58	2.47	2.03
Trips per household	8.21	8.24	6.38
Trips per vehicle	4.65	5.61	5.62

[a] Billings Metropolitan Area Transportation Study, DeLeuw, Cather and Co., February, 1964.

[b] Great Falls Urban Transportation Survey, Vol. IV, Montana State Highway Commission, Planning Survey Division, September, 1965.

[c] Trips by area residents only

Source: Clark, Coleman & Rupeiks, Inc.

TABLE IV - 8

SUMMARY OF INTERNAL AND EXTERNAL PERSON TRIPS

	Number of Trips	Percent of Internal Trips
INTERNAL		
Auto driver	90,328	57.4
Auto passenger	40,685	25.9
Truck driver	23,035	14.6
Bus passenger	1,516	1.0
School bus passenger	925	0.6
Truck-taxi passenger	785	0.5
TOTAL	157,274	100.0
EXTERNAL		
Auto and truck driver	13,949	
THROUGH TRIPS	4,275	
CORDON LINE CROSSING	22,499	

Source: Clark, Coleman & Rupeiks, Inc.

home based work trips, all other home based trips, non-home based trips and commercial vehicle trips.

The expanded trip data were analyzed to determine how trip length varied with the purpose of trips. As is the case in most cities, the average trip length for home based work trips was the longest, with an average of 10.98 minutes and a median length of 10.0 minutes. This can be compared with Figure 7, which shows that the intersection of Higgins Avenue and Main Street in the Central Business District is accessible from any point in Missoula in less than ten minutes. Table IV-9 shows the average trip

TABLE IV - 9

INTERNAL TRIPS CLASSIFIED BY TRIP PURPOSE

Trip Purpose	1965 Trips	Percent of Total	Average Trip Length (minutes)
Home-based work	23,921	18.8	10.98
Home-based other	51,578	40.5	9.47
Non-home based	29,866	23.5	8.73
Commercial vehicle	21,947	17.2	8.34
TOTAL	127,312	100.0	9.39

Source: Clark, Coleman & Rupeiks, Inc.

length in minutes for the four trip purposes. Not surprisingly, the commercial vehicle trips are the shortest in length. The trip frequency distribution for the various trip purposes is shown in Figure 26.

The origin-destination survey provided information about the spatial distribution of trips. Classified by trip end and purpose, the data in Table IV-10 show that while 26.7 percent of all non-home based trips have a trip end in the CBD, only 14.0 percent of the other home based trips do. Of the total number of internal trips, 18.3 percent are either destined for or exiting from the CBD.

Similar information, obtained in the external survey, is presented in Table IV-11. Less than nine percent of the non-through external traffic has a trip end in the CBD. Again, the non-home based trips have the highest attraction to the CBD.

The travel survey findings, including number and spatial distribution of trips, mode of travel, trip length and purpose, and trip generating characteristics, will be used to forecast future travel demand and urban development. The validity of the data, as established by the accuracy checks, allows these forecasts to be made with a high degree of confidence.

TABLE IV - 10

INTERNAL TRIP ENDS CLASSIFIED BY TRIP PURPOSE

	CBD	Percent to CBD	Non-CBD
Home-based work	4,184	17.5	19,737
Home-based other	7,215	14.0	44,363
Non-home based	7,963	26.7	21,903
Commercial vehicle	3,954	18.0	17,993
TOTAL	23,316	18.3	103,996

Source: Clark, Coleman & Rupeiks, Inc.

TABLE IV - 11

EXTERNAL TRIP ENDS CLASSIFIED BY TRIP PURPOSE

	CBD	Percent to CBD	Non-CBD	Total
Home-based work	328	9.1	3,290	3,618
Home-based other	670	8.5	7,244	7,914
Non-home based	81	14.3	487	568
Commercial vehicle	127	6.9	1,722	1,849
TOTAL	1,206	8.6	12,743	13,949

CHAPTER 5

CHAPTER V TERMINAL FACILITIES

Transportation terminal facilities are vital for the functioning of the modern urban community. Each terminal completes a particular trip linkage and has important bearing on land use. Thus, local and regional passenger and freight terminals are essential components of the urban transportation system and should be carefully considered in system planning and design. Their location and function are important to both urban and regional mobility.

Person travel in the Missoula urban area is predominantly auto oriented and is forecast to remain so in the future. Consequently, the terminal facilities studies and planning are concerned mostly with automobile parking in the Central Business District, on the university campus, in outlying shopping centers and at the airport. Studies of major truck transfer and terminal facilities have also been included.

CENTRAL BUSINESS DISTRICT PARKING

An adequate supply of well-located parking is vital to the economic health and continued prosperity of the CBD. In this auto oriented age, the CBD that lacks such a supply can never realize its economic potential and is likely to see many of its functions transferred to outer locations where abundant land for parking is available.

In order to measure the effectiveness of existing parking facilities in the Missoula CBD and to provide accurate guidelines for determining existing and future parking needs, a comprehensive interview parking survey was carried out in the fall of 1965.

In April and May of 1957, a comprehensive interview parking survey was conducted by the staff of the Montana State Highway Commission. The survey resulted in recommending, among other things, the immediate provision of 159 off-street parking spaces and an additional provision of 250 spaces by 1967.

The 1965 survey area contained approximately 40 blocks and encompassed all of the densely developed area as well as all of the 1957 survey area. On the north and south, the survey area is bounded by the railroad and

the Clark Fork River. On the west beginning at the Orange Street Bridge, the boundary follows along Orange Street to Pine Street, from Pine Street to Woody Street and then along Woody Street to the railroad tracks. On the east, beginning at the river, the boundary follows along the line of Adams Street to Spruce Street, along Spruce Street to Pattee Street and then along Pattee Street to the railroad tracks.

Field studies were carried out in September and October of 1965. Data collected consisted of an inventory of existing parking facilities and interview of parkers. A count of all vehicles entering and leaving the area was conducted. Traffic volumes on all the major central area streets were measured.

Parkers destined to each survey area during typical weekdays were interviewed between 10:00 a.m. and 6:00 p.m. Information such as type of parking space occupied, type of vehicle, time of arrival and departure, origin of trip, primary destination while parked, purpose of trip, and home address, was gathered either by observation or by direct interview. Information from parkers who were difficult to contact in person was obtained by postcard questionnaires.

Parking Space Inventory

A complete inventory was made of all available parking spaces in the survey area. For curb parking, each foot of the curb was measured and the parking controls noted. The location, capacity and predominant use of each off-street facility was ascertained. In the fall of 1965, the survey area contained a total of 5,133 parking spaces. Of the total, about 40 percent, or 2,033 spaces, were located at the curb and the remaining 3,100, or 60 percent, were located in off-street facilities.

Curb Parking. Of the curb spaces within the survey area, 1,063, or 52 percent, were metered with time limits ranging from 24 minutes to four hours. There were 53 curb spaces which were not metered but had posted time limits ranging from one to two hours. Unrestricted curb parking spaces amounted to 815, or about 40 percent. There were a total of 102 spaces in truck and passenger loading zones, taxi stands and in special permit parking zones. The curb parking space inventory is illustrated in Figure 13 and is summarized in Table V-1.

It is significant to note that almost all the curb parking in the four block retail core area bounded by Ryman, Broadway,

CURB PARKING INVENTORY

SUPPLY REPRESENTS FALL OF 1965 CONDITIONS

Legend

- 24-36 Minute Meter
- 1 Hour Meter
- 2 Hour Meter
- 4 Hour Meter
- Posted Time Limit
- Loading Zone - Special Permit
- Unrestricted Parking
- No Parking
- Angle Parking

FIGURE 13

Clark, Coleman & Rupeiks, Inc
Seattle - Helena

TABLE V - 1

CURB PARKING INVENTORY

	Number Spaces	Available Space-Hours[a]	Percent
METERED			
24 minute	46	368	2.3
36 minute	16	128	0.8
1 hour	334	2,672	16.4
2 hour	550	4,400	27.1
4 hour	117	936	5.7
Subtotal	1,063	8,504	52.3
UNMETERED			
1 hour limit	27	216	1.3
2 hour limit	26	208	1.3
No restriction	815	6,520	40.1
Subtotal	868	6,944	42.7
OTHER			
Restricted	53	424	2.6
Passenger load	30	240	1.5
Truck load	19	152	0.9
Subtotal	102	816	5.0
TOTAL	2,033	16,264	100.0

[a]Between 10:00 a.m. and 6:00 p.m. on weekdays

Source: Clark, Coleman & Rupeiks, Inc.

Pattee and Front is controlled by parking meters ranging in time limit from 24 minutes to two hours. Much of this curb parking is likely to be eliminated as traffic volumes increase in order to provide turning lanes at intersections. The growth and intensity of traffic on the central area streets may necessitate replacement of angle parking with parallel parking.

The entire parking survey area contained 51,547 lineal feet of curb, an aggregate length of almost ten miles. Curb space allocated for parking amounted to 34,788 lineal feet, or 67 percent of the total. Curb space in no parking use amounted to 16,759 lineal feet, or 33 percent of the total.

In a community such as Missoula, the total lineal feet of curb is fixed. Any changes that may take place will be from unmetered curb parking to metered or to no parking zones. Also, the presently metered parking may be converted to no parking and loading zones. The total lineal feet of curb in no parking use will most likely increase.

Off-Street Parking. At the time of the parking inventory, there were 3,100 off-street parking spaces in the survey area. Of this total, 2,618 spaces, or about 85 percent, were in off-street lots and 482, or about 15 percent, were in garages. Certain business and retail establishments provided their customers with 665 off-street parking spaces free of charge. The City provided the land area on the waterfront capable of accommodating 773 parking spaces. The commercial parking lot or garage operators provided 320 spaces on an hourly charge basis and 378 spaces on a long-term lease basis. About 964 off-street spaces were provided by a number of business establishments, reserved and restricted for their employees. The off-street parking supply is illustrated in Figure 14 and is summarized in Table V-2.

The four block retail core area of the CBD, the area of high parking demand, contained relatively few off-street parking facilities. As space is needed for the central area expansion, much of this land in the retail core area may be utilized for new construction of retail and office buildings. Therefore, the future availability of many off-street spaces as permanent parking supply in the retail core area is uncertain.

OFF-STREET PARKING FACILITIES

SUPPLY REPRESENTS FALL OF 1965 CONDITIONS

Legend

- Customer Lot Free
- Municipal Lot Restricted, Informal Parking
- Private Restricted and/or Employee Parking
- Commercial Lot Pay Short Term
- Commercial Lot Lease Long Term
- Auto Dealer Storage Lot
- Municipal Lot Free
- Garage, Customer Free
- Garage, Private Restricted and/or Employee Parking
- Commercial Pay, Short Term Garage
- Garage, Commercial Lease, Long Term
- Garage Auto Dealer Storage
- Number of Stalls

FIGURE 14

Clark, Coleman & Rupeiks, Inc.
Seattle - Helena

Pattee and Front is controlled by parking meters ranging in time limit from 24 minutes to two hours. Much of this curb parking is likely to be eliminated as traffic volumes increase in order to provide turning lanes at intersections. The growth and intensity of traffic on the central area streets may necessitate replacement of angle parking with parallel parking.

The entire parking survey area contained 51,547 lineal feet of curb, an aggregate length of almost ten miles. Curb space allocated for parking amounted to 34,788 lineal feet, or 67 percent of the total. Curb space in no parking use amounted to 16,759 lineal feet, or 33 percent of the total.

In a community such as Missoula, the total lineal feet of curb is fixed. Any changes that may take place will be from unmetered curb parking to metered or to no parking zones. Also, the presently metered parking may be converted to no parking and loading zones. The total lineal feet of curb in no parking use will most likely increase.

Off-Street Parking. At the time of the parking inventory, there were 3,100 off-street parking spaces in the survey area. Of this total, 2,618 spaces, or about 85 percent, were in off-street lots and 482, or about 15 percent, were in garages. Certain business and retail establishments provided their customers with 665 off-street parking spaces free of charge. The City provided the land area on the waterfront capable of accommodating 773 parking spaces. The commercial parking lot or garage operators provided 320 spaces on an hourly charge basis and 378 spaces on a long-term lease basis. About 964 off-street spaces were provided by a number of business establishments, reserved and restricted for their employees. The off-street parking supply is illustrated in Figure 14 and is summarized in Table V-2.

The four block retail core area of the CBD, the area of high parking demand, contained relatively few off-street parking facilities. As space is needed for the central area expansion, much of this land in the retail core area may be utilized for new construction of retail and office buildings. Therefore, the future availability of many off-street spaces as permanent parking supply in the retail core area is uncertain.

OFF-STREET PARKING FACILITIES

SUPPLY REPRESENTS FALL OF 1965 CONDITIONS

Legend

- Customer Lot Free
- Municipal Lot Restricted, Informal Parking
- Private Restricted and/or Employee Parking
- Commercial Lot Pay, Short Term
- Commercial Lot Lease, Long Term
- Auto Dealer Storage Lot
- Municipal Lot Free
- Garage, Customer Free
- Garage, Private Restricted and/or Employee Parking
- Commercial Pay, Short Term Garage
- Garage, Commercial Lease, Long Term
- Garage Auto Dealer Storage
- Number of Stalls

FIGURE 14

Clark, Coleman & Rupeuks, Inc.
Seattle - Helena

TABLE V - 2

OFF-STREET PARKING INVENTORY

Type	Number Spaces	Available Space-Hours[a]	Percent
Parking Lots			
Customer	448	3,584	14.5
Commercial Pay	200	1,600	6.4
Commercial Lease	318	2,544	10.3
Municipal	773	6,184	24.9
Private Restricted	879	7,032	28.4
Subtotal	2,618	20,944	84.5
Garage Space			
Customer	217	1,736	7.0
Commercial Pay	120	960	3.9
Commercial Lease	60	480	1.9
Private Restricted	85	680	2.7
Subtotal	482	3,856	15.5
TOTAL	3,100	24,800	100.0

[a]Between 10:00 a.m. and 6:00 p.m. on weekdays

Source: Clark, Coleman & Rupeiks, Inc.

Within the parking survey area, about 944,600 square feet of land area was devoted to off-street parking use. Expressing this measure in equivalent city blocks, 10.5 of the 40 blocks in the survey area were in off-street parking use. There were a total of 236 off-street parking facilities with an average facility size of 14 spaces. Each space, on the average, consumed 305 square feet of land area. The greatest amount of land was in private restricted parking use, amounting to 293,000 square feet. Only about 91,600 square feet of land area was provided by commercial lot operators on an hourly pay basis.

Limiting the comparison to the 1957 parking survey area, curb parking had decreased by 67 spaces or 6.1 percent. The area lost 23 metered and 44 unmetered spaces. Direct comparison with off-street parking spaces cannot readily be made because only the off-street facilities of substantial size were inventoried. However, it can be generally concluded that the off-street parking supply has grown considerably and has exceeded the 1957 recommended acquisition of 409 off-street spaces.

Curb parking spaces provided 40 percent, off-street lots 51 percent and garages nine percent of the total parking supply. Some 4,067 parking spaces were available to the general public on "first come, first serve" basis, while 1,066 parking spaces were restricted to specific users. Municipal control over off-street parking was limited to 773 off-street spaces located on the waterfront. Table V-3 summarizes the 1965 parking space inventory.

Parking Characteristics

During the interview phase of the survey, parkers were questioned as to trip purpose, origin of trip, primary destination upon parking and home address. Other parking data such as type of vehicle, type of parking facility utilized and duration of parking were gathered by observation. Walking distances were later measured and recorded. Analysis of these characteristics provided basic data for determining parking demands and needs.

Directional traffic volume counts were taken on all the streets crossing the parking survey area boundary. As shown in Table V-4, a total 55,858 vehicles entered and left the survey area on all streets between 10:00 a.m. and 6:00 p.m. during a typical weekday. The peak movement occurred between 4:00 and 5:00 p.m. when about

TABLE V - 3

SUMMARY OF PARKING SPACE INVENTORY

Type	Number Spaces	Available Space-Hours[a]	Percent
Curb			
Metered	1,063	8,504	20.7
Unmetered	868	6,944	16.9
Other	102	816	2.0
Subtotal	2,033	16,264	39.6
Parking Lots			
Available to Public	1,739	13,912	33.9
Restricted	879	7,032	17.1
Subtotal	2,618	20,944	51.0
Garages			
Available to Public	397	3,176	7.7
Restricted	85	680	1.7
Subtotal	482	3,856	9.4
TOTAL	5,133	41,064	100.0

[a]Between 10:00 a.m. and 6:00 p.m. on weekdays

Source: Clark, Coleman & Rupeiks, Inc.

TABLE V - 4

TRAFFIC ENTERING AND LEAVING SURVEY AREA

	In	Out	Accumulation
Cruising at 10:00 a.m.			171
Parked at 10:00 a.m.			2,951
10:00 - 11:00 a.m.	2,766	2,629	3,259
11:00 - 12:00 noon	3,100	3,178	3,181
12:00 - 1:00 p.m.	3,440	3,478	3,143
1:00 - 2:00	3,590	3,330	3,403
2:00 - 3:00	3,290	3,282	3,411
3:00 - 4:00	3,752	3,848	3,315
4:00 - 5:00	4,100	4,304	3,111
5:00 - 6:00	3,697	4,073	2,735
TOTAL	27,736	28,122	

Source: Clark, Coleman & Rupeiks, Inc.

8,400 vehicles crossed the parking survey boundary. The peak vehicle accumulation occurred between 2:00 and 3:00 p.m. when 3,411 vehicles were either parked or moving on the streets.

The traffic volumes entering and leaving the parking survey area between 10:00 a.m. and 6:00 p.m. on a typical weekday are shown by street of exit and entry on Figure 15. High traffic volumes, as expected, are found on Orange Street and Higgins Avenue Bridges and on Broadway. Highest volumes were found on Higgins Avenue Bridge where about 5,000 vehicles entered and 5,400 vehicles exited.

The approach directions of parkers destined to the parking survey area are shown in Table V-5. Eight corridors of approach to the central area were chosen to correspond with major arterial streets and used by the majority of drivers. During an average weekday, 9,097 or about 58 percent of all parkers, entered and left the parking survey area by crossing the Clark Fork River. The number of parkers from the west amounted to 2,135, or about 14 percent. A total of 691 parkers, or 4 percent, entered from the north; 2,379, or about 15 percent, entered from the east; and the remaining 1,321, about 9 percent of parkers, came from the immediate vicinity of the CBD. A total of 12,572 parkers, or about 80 percent of the total, came from within the Study Area.

Accumulation of Parked Vehicles. The maximum accumulation of parkers occurred between 2:00 and 2:30 p.m. when 3,031 spaces were occupied, representing 59 percent of the total available supply. Table V-6 shows the accumulation of parkers by vehicle type and by type of facility. Figure 16 shows the accumulation of parkers in curb and off-street facilities. The peak accumulation of both autos and trucks occurred between 2:00 and 2:30 p.m. At the curb and in off-street lots, the peak accumulation also occurred between 2:00 and 2:30 p.m. The peak accumulation in the garages occurred between 10:00 and 10:30 a.m. After 2:00 p.m. the accumulation of parked vehicles decreased steadily and at 6:00 p.m., only 1,230, about 24 percent, of the parking spaces were occupied.

The average motorist is motivated by many factors in choosing his parking space. These include walking distance from parking place to primary destination,

TRAFFIC
ENTERING AND LEAVING
PARKING SURVEY AREA

FIGURE 15

Clark, Coleman & Rupeiks, Inc
Seattle - Helena

TABLE V - 5

APPROACH DIRECTION OF PARKERS

Sector	Number	Percent
North of Clark Fork River		
Central Business District	1,321	8.5
West Broadway, Mullan Road	937	6.0
North of Railroad	470	3.0
Rattlesnake, West of Creek	221	1.4
Rattlesnake and East Missoula	1,224	7.8
Subtotal	4,173	26.7
South of Clark Fork River		
East of Arthur	1,774	11.4
Between Railroad and Arthur	4,168	26.7
West of Railroad	2,457	15.7
Subtotal	8,399	53.8
Outside Urban Area		
From the West	1,184	7.6
From the East	1,155	7.4
From the South	698	4.5
Subtotal	3,037	19.5
TOTAL	15,609	100.0

Source: Clark, Coleman & Rupeiks, Inc.

TABLE V - 6

ACCUMULATION OF PARKERS BY VEHICLE TYPE AND FACILITY

Time Beginning	Autos	Trucks	Curb	Lots	Garage	Total
10:00 a.m.	2,510	314	1,340	1,285	199	2,824
10:30	2,541	314	1,365	1,293	197	2,855
11:00	2,466	329	1,350	1,253	192	2,795
11:30	2,327	313	1,287	1,158	195	2,640
12:00 noon	2,329	286	1,321	1,108	186	2,615
12:30 p.m.	2,449	287	1,409	1,150	177	2,736
1:00	2,589	306	1,485	1,224	186	2,895
1:30	2,648	310	1,515	1,258	185	2,958
2:00	2,692	339	1,538	1,307	186	3,031
2:30	2,640	313	1,517	1,254	182	2,953
3:00	2,619	312	1,523	1,228	180	2,931
3:30	2,560	319	1,475	1,226	178	2,879
4:00	2,484	317	1,471	1,143	187	2,801
4:30	2,318	272	1,376	1,037	177	2,590
5:00	1,846	230	1,096	819	161	2,076
5:30	1,072	158	860	274	96	1,230

Source: Clark, Coleman & Rupeiks, Inc.

traffic generation in the vicinity of parking facilities, the comparative cost of curb and off-street parking, the availability of choice curb spaces and other reconsiderations. In general, the average daily usage of any parking facility is a reasonable indication of its accessibility and popularity with parkers and its value in serving parking needs in the vicinity of primary generators.

On a typical weekday between 10:00 a.m. and 6:00 p.m., about 62 percent of the parkers occupied metered curb spaces, which comprise only 21 percent of the total parking supply. As shown in Table V-7, about 26 percent of all parkers occupied off-street parking spaces which comprise about 60 percent of the supply.

About 87 percent of all parkers utilized private autos, while the remaining 13 percent utilized light trucks.

One out of every twenty-five or about four percent, of all parkers, violated the posted or marked curb parking regulations other than overtime parking. A majority of the passenger auto curb parking violations were parked in prohibited curb parking areas. During the 10:00 a.m. to 6:00 p.m. period, 173 trucks were observed violating the curb

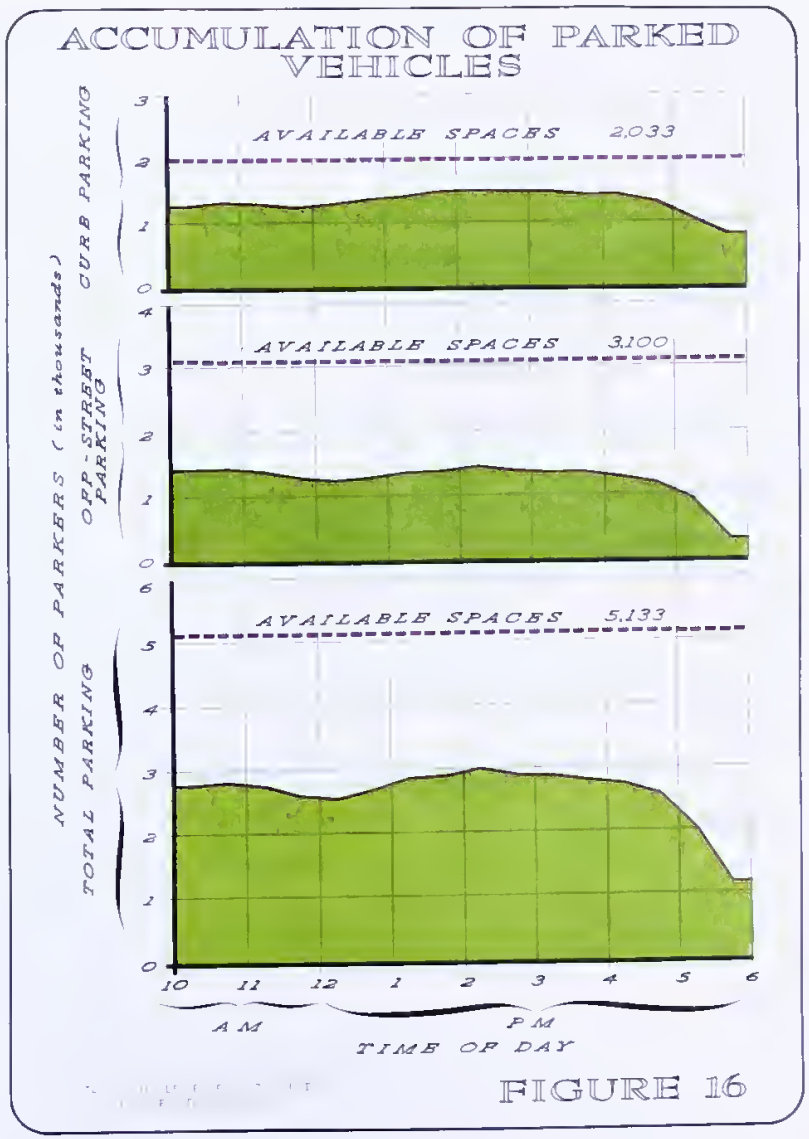


FIGURE 16

TABLE V - 7

PARKING SPACE USAGE BY VEHICLE TYPE AND FACILITY

Facility	Autos	Trucks	Total	Percent
Legal Curb				
Metered	8,474	1,223	9,697	62.2
Unmetered	1,034	127	1,161	7.4
Other	83	64	147	0.9
Subtotal	9,591	1,414	11,005	70.5
Illegal Curb				
Loading zones by car	137	3	140	0.9
Alleys, Driveways	64	40	104	0.7
Prohibited Curb	247	127	374	2.4
Other	3	3	6	--
Subtotal	451	173	624	4.0
Lots	3,147	398	3,545	22.7
Garages	376	59	435	2.8
TOTAL	13,565	2,044	15,609	100.0
Percent	86.9	13.1	100.0	

Source: Clark, Coleman & Rupeiks, Inc.

parking regulations. One out of every twelve trucks, over eight percent, violated curb parking regulations, mostly by parking in prohibited curb parking areas.

A direct measure of the efficiency of parking space usage is the average number of automobiles using each available space during a typical weekday between 10:00 a.m. and 6:00 p.m. This space usage, or turnover, is defined as the number of vehicles parked in each space per day. As shown in Table V-8, curb metered spaces had an average turnover of 9.1, since 9,697 parkers utilized 1,063 available curb spaces. The turnover for unmetered curb spaces was 1.3 resulting in a total curb space turnover of 5.4 vehicles per space.

The parking turnover in off-street facilities available to the public amounted to 1.5 while the turnover in private restricted off-street facilities amount to 0.9, resulting in an overall turnover rate of 1.3 parkers per space in off-street facilities. The parking turnover in off-street facilities is considerably lower than in curb spaces, indicating that the off-street facilities are utilized mostly for long-term parking.

The duration of parking is an indicator of the adherence of the parkers to the established time limit controls. The duration of parking is also an indication of the effectiveness of enforcement of parking regulations. Table V-9 shows the average length of time parked in various curb and off-street facilities. Along the curb, the average duration of parking amounted to an even one hour. The 24 minute curb metered spaces had a duration of 15 minutes while the duration in unrestricted curb spaces amount to 3 hours and 36 minutes. The parking duration in off-street facilities amounted to 2 hours and 32 minutes. The overall duration of parking of all parkers in the parking survey area amounted to one hour and 27 minutes.

It is significant to note that in the two-hour posted curb parking zones, the average duration was 2 hours and 54 minutes. This may indicate a small number of parkers parking for long durations or a constant violation by the majority of parkers in this area. Regardless of the cause, the two-hour posted curb parking zones are obviously not patrolled adequately and parking limits are not enforced.

An additional significant observation is the duration of 55 minute parking in illegal curb spaces. This again points to lack of enforcement of parking regulations.

TABLE V - 8

PARKING SPACE TURNOVER

Type	Number of Parkers	Number of Spaces	Turnover
Metered Curb			
24 minutes	1,021	46	22.2
36 minutes	177	16	11.1
1 hour	3,942	334	11.8
2 hour	4,161	550	7.4
4 hour	396	117	3.4
Subtotal	9,697	1,063	9.1
Unmetered Curb			
Time limit	81	53	1.5
Unrestricted	1,080	815	1.3
Other	147	102	1.4
Subtotal	1,308	970	1.3
Total Curb	11,005	2,033	5.4
Off-Street			
Public	3,112	2,136	1.5
Private	868	964	0.9
Subtotal	3,980	3,100	1.3
TOTAL	14,985	5,133	2.9

Source: Clark, Coleman & Rupeiks, Inc.

TABLE V - 9

TYPE OF PARKING AND DURATION

Type	Less Than Three Hours	More Than Three Hours	Total	Average Time Parked
Curb				
24 minute meter	1,021		1,021	0:15
36 minute meter	176	1	177	0:24
1 hour meter	3,720	222	3,942	0:34
2 hour meter	3,846	315	4,161	0:43
4 hour meter	342	54	396	1:25
1 hour posted	11	11	22	0:21
2 hour posted	36	23	59	2:54
Unrestricted	547	533	1,080	3:36
Other legal curb	123	24	147	1:00
Illegal curb	566	58	624	0:55
Subtotal	10,608	1,021	11,629	1:00
Off-Street	2,565	1,415	3,980	2:32
TOTAL	13,173	2,436	15,609	1:27

Source: Clark, Coleman & Rupeiks, Inc.

Trip Purposes. Trip purpose information was obtained and summarized in six categories: shopping, business, work, sales and service, truck loading and unloading, and others. Shopping included parkers who purchased goods in retail or wholesale establishments. Business parkers included those who visited doctors, lawyers, office buildings and other specific destinations for the purpose of conducting personal business of any kind. Work was considered the trip purpose when a parker occupied a space near his place of employment during working hours. All parkers who were sales personnel or service representatives were categorized in sales and service. Trucks occupying space for loading and unloading merchandise or equipment were placed in the loading and unloading category. All other purposes were recorded in the other category. Characteristics of parkers as related to their trip purposes provide valuable correlations with respect to parking duration, type of facility occupied, distance walked to the primary destination and other factors.

The hourly accumulation of parkers by major category of trip purpose is shown in Table V-10. During a typical weekday, the peak accumulation of parking for the purpose of shopping occurred between 1:00 and 2:00 p.m. The peak business parking occurred between 2:00 and 3:00 p.m., and the peak for work occurred between 10:00 and 11:00 a.m. The evening work-to-home travel is quite evident after 4:00 p.m. when the parking accumulation drops from 1,137 to 381 automobiles.

The origins of parkers for the trip purposes of shopping, business, work and other are shown in Table V-11. About 51 percent of all shopping trips originate south of the Clark Fork River, 23 percent from the north of the river and 25 percent from outside the urban area. The majority of work trips, about 68 percent, originate from south of the river while a mere six percent come from outside the urban area.

In Table V-12, the number of parkers and the number of space-hours used for each trip purpose are compared. The short-time duration of shoppers and business parkers and the long average duration of workers is quite evident. Although 22 percent of all parkers were shoppers, their parking space use amounted to only 10 percent of all space-hours used. Parkers on business trips comprised 31 percent of all parkers but utilized 20 percent of all space hours of parking. Workers, on the other hand, totaled 19 percent of all parkers but used 52 percent of total space hours of parking.

TABLE V - 10

NET ACCUMULATION OF PARKERS BY TRIP PURPOSE

Time Beginning	Shopping	Business	Work	Other	Total
10:00 a.m.	243	582	1,743	287	2,855
11:00	233	555	1,498	354	2,640
12:00 noon	275	558	1,439	464	2,736
1:00 p.m.	350	676	1,525	407	2,958
2:00	331	696	1,520	406	2,953
3:00	329	625	1,510	415	2,879
4:00	289	573	1,322	406	2,590
5:00	134	306	411	379	1,230

Source: Clark, Coleman & Rupeiks, Inc.

TABLE V - 11

ORIGIN OF PARKERS BY TRIP PURPOSE

	Shop	Business	Work	Other	Total
North of Clark Fork River	936	1,415	606	1,216	4,173
South of Clark Fork River	2,057	3,067	1,549	1,726	8,399
Outside Urban Area	1,010	1,061	136	830	3,037
TOTAL	4,003	5,543	2,291	3,772	15,609

Source: Clark, Coleman & Rupeiks, Inc.

TABLE V - 12

PARKING USAGE BY TRIP PURPOSE

	Parkers	Percent	Space Hours	Percent
Shopping	3,377	21.7	2,195	9.9
Business	4,883	31.3	4,541	20.3
Work	2,976	19.1	11,487	51.6
Sales and Service	453	2.9	331	1.5
Load and Unload	266	1.7	186	0.8
Other	2,799	17.9	2,603	11.7
Unidentified	855	5.4	923	4.2
TOTAL	15,609	100.0	22,266	100.0

Source: Clark, Coleman & Rupeiks, Inc.

Trip purpose is related to the type of parking facility used in Table V-13. About 86 percent of all parking for the purpose of shopping was in curb spaces; only 14 percent were accommodated in off-street facilities. In the work purpose category, 52 percent of all parkers utilized curb spaces and 48 percent utilized off-street facilities.

Parking duration by trip purpose is shown in Table V-14. The average parker on a shopping trip consumed 39 minutes of parking. Those persons parking for business purposes consumed an average of 56 minutes of parking. The workers in the parking survey area averaged about 3 hours and 51 minutes of parking. This is low and may

TABLE V - 13

TRIP PURPOSE AND TYPE OF PARKING

Trip Purpose	Curb	Percent	Off-Street	Percent
Shopping	2,892	85.7	481	14.3
Business	3,550	72.8	1,333	27.2
Work	1,549	52.0	1,431	48.0
Sales and Service	365	80.7	88	19.3
Load and Unload	240	90.1	26	9.9
Other	2,394	85.6	405	14.4
Unknown	639	74.8	216	25.2
TOTAL	11,629	74.5	3,980	25.5

Source: Clark, Coleman & Rupeiks, Inc.

TABLE V - 14

TRIP PURPOSE AND PARKING DURATION

Trip Purpose	0 - 29[a]	30 - 59	60 - 179	180+	Average
Shopping	2,213	673	399	92	0:39
Business	3,093	732	675	333	0:56
Work	337	185	914	1,540	3:51
Sales and Service	237	162	38	15	0:44
Load and Unload	216	8	20	23	0:42
Other	1,593	541	471	194	0:56
Unidentified	528	111	130	86	1:05
TOTAL	8,217	2,412	2,647	2,333	1:26

[a]Duration measured in minutes

Source: Clark, Coleman & Rupeiks, Inc.

attributed to the fact that a great number of workers go home for lunch and return, thus increasing the turnover and reducing the duration.

Walking Distance. The distance a parker is willing to walk to his primary destination is an important consideration in evaluating parking demands and needs. In Missoula, the average walking distance walked for all parkers was 365 feet.

As shown in Table V-15, the average walking distance for all shoppers was 308 feet. The longest walking distance of 612 feet was encountered by the worker. Of the total parkers, 10,058 or 68 percent of all parkers walked less than 350 feet from the place of parking to the primary destination. This distance is little more than one average block face in the central area of Missoula.

Truck Parking. Trucks of all categories, ranging from pickup or panel to multi-axle semi-trailer trucks, were found to utilize parking space in the central area. Table V-16 outlines in detail the number of trucks utilizing different parking facilities. About 60 percent of all trucks used metered curb spaces while only two percent of the trucks utilized truck loading zones. It is quite evident that the use of pickup trucks in the Missoula urban area is mostly for the purpose of personal transportation. The utilization of off-street facilities by trucks amounted to about 22 percent.

Parking Revenues. Parking needs should be related to something more than an average month, but probably less than the peak month. Over the years, general experience has been to design parking facilities in central business districts to meet the third highest monthly demand. The monthly fluctuation in parking revenues is the most useful index available for relating the study month to the design month. Table V-17 shows the monthly parking meter revenues for the years 1963 through 1965. The month of October is noted as the third highest month in terms of parking revenues. Since the parking interview survey was carried out in the month of October, no seasonal variation factor was required to be applied to the parking data.

Parking Demands and Needs

Parking demand in the CBD has been analyzed to determine the supply-demand relationship and existing parking

TABLE V - 15

WALKING DISTANCES BY TRIP PURPOSE

Trip Purpose	Less Than 350 Feet	More Than 350 Feet	Average Walking Distance (feet)
Shopping	2,352	1,025	308
Business	3,445	1,438	305
Work	1,070	1,906	612
Sales and Service	288	165	425
Load and Unload	209	57	260
Other	2,037	762	299
Unknown	657	198	310
TOTAL	10,058	5,551	365

Source: Clark, Coleman & Rupeiks, Inc.

TABLE V - 16

TRUCK PARKING BY TYPE OF FACILITY

Facility	Number of Trucks	Percent
Legal Curb		
Metered	1,223	59.8
Unmetered	127	6.2
Truck load zones	43	2.1
Special permit	6	.3
Passenger load zones	15	.7
Subtotal	1,414	69.1
Illegal Curb		
Alleys and driveways	40	2.0
Prohibited curb	127	6.2
All other	6	.3
Subtotal	173	8.5
Lots	398	19.5
Garages	59	2.9
TOTAL	2,044	100.0

Source: Clark, Coleman & Rupeiks, Inc.

TABLE V - 17

PARKING METER REVENUES

	1963	1964	1965	Average	Percent
January	$ 5,511	$ 5,659	$ 4,952	$ 5,373	7.4
February	4,366	4,222	5,748	4,774	6.6
March	5,727	6,701	5,917	6,114	8.5
April	6,271	5,910	6,148	6,109	8.5
May	5,702	5,074	5,622	5,465	7.6
June	5,921	6,421	7,883	6,741	9.3
July	6,748	7,208	6,235	6,730	9.3
August	6,660	6,224	6,089	6,324	8.8
September	5,557	5,849	6,305	5,903	8.2
October	6,826	6,780	6,523	6,709	9.3
November	4,836	5,181	6,161	5,392	7.5
December	6,350	6,609	6,500	6,486	9.0
Subtotal	70,475	71,838	74,083	72,120	100.0
Additional	1,544	2,284	3,177	2,335	
TOTAL[a]	$72,019	$74,122	$77,260	$74,455	

[a] Missoula Central Business District

Source: Clark, Coleman & Rupeiks, Inc.

needs. Parking demand has been developed for each block in the central area. The surplus and deficiencies were determined by relating existing parking demands to the existing supply of parking space at the curb and in off-street facilities.

The central business district contains the majority of the urban area's major office buildings and business establishments, including its department stores, banks, government buildings and service agencies. The destination of each parker was ascertained during the parking survey and it was found that the four block retail core area bounded by Ryman, Broadway, Pattee and Front Streets attracted 31 percent of the total destinations in the parking survey area. In terms of parker destinations, this amounted to 4,820 trip ends.

The 15,609 parkers between the hours of 10:00 a.m. and 6:00 p.m. in a typical weekday created a parking demand amounting to 21,665 space hours. The parking demand expressed in space hours and related to trip purpose has been developed for each block in the survey area. The block having the greatest shopping demand, amounting to 694 space hours, was the block in which the Missoula Mercantile Department Store is located. The post office block had the highest demand in business trips, amounting to 434 space hours, while the block bounded by Broadway, Pattee, Main and Higgins had a 1,556 space hour demand for work trips. The latter block also had the highest overall parking demand of 2,181 space hours.

Two types of parking demand, short-term and long term, have been recognized. Using a duration of three hours as a dividing point, space hour demand for each block was placed into two categories on the basis of the parking characteristics observed. In general, parking demand created by the purpose of work was considered long-term demand and demand created by other trip purposes was considered short-term parking demand. The supply of available space-hours was also divided into the two categories. Spaces which are clearly indicated to satisfy only short-term parkers, such as curb metered spaces from 24 minute meters to and including two hour meters, curb spaces with time limitations, and customer and commercial pay off-street facilities, were classified as short-term supply. Other spaces along the curb and in off-street facilities were classified long-term supply.

By relating parking demand to available parking supply at the block level, the parking space surplus and deficiencies can be determined. Before net parking surplus and deficiencies can be determined, the parking supply has to be adjusted to represent the available or practical capacity of supply. It has been found that short-term, high turnover off-street lots and garages operate at 85 percent capacity. Curb parking in metered spaces usually operates at 90 percent capacity. Time is lost in maneuvering in and out of the facility or curb space. Private restricted and customer off-street facilities have been considered to operate at the capacity of their measured use.

During an eight hour period from 10:00 a.m. to 6:00 p.m., on a typical weekday within the parking survey area, the 5,133 parking spaces at the curb and in off-street facilities provided a total of 41,064 space hours of parking supply. After the adjustments indicated above were made, a supply of 29,948 space-hours was found to be available. Of this supply, 10,975 space-hours, or about 27 percent, were classified as short-term supply and 18,973 space-hours, or 73 percent, constituted the long-term supply.

Table V-18 is a summary of the 1965 parking supply and demand, surplus or deficiency of space-hours for each block for short-term and long-term categories. As indicated in the table, it was found that there is an overall surplus of approximately 2,044 short-term space-hours and 6,240 space-hours of long-term parking within the survey area. However, due to the unequal distribution of supply and demand, individual blocks within the area have deficiencies totaling 1,745 short-term and 6,543 long-term space hours.

Figure 17 illustrates in graphic form the short-term surplus and deficiencies of the individual blocks. It may be noted that the areas of greatest short-term parking deficiency are the post office and the retail core area, the areas of highest short-term parking demand. By contrast, the areas of short-term parking surplus are in the fringe of the core.

Figure 18 illustrates the net surplus and deficiencies found for long-term parking. It is apparent that the contrast between blocks showing a surplus and those with a deficiency of long-term parking supply is much more marked than in the short-term class. Six blocks were found with a surplus of 600 space-hours or more and three blocks were found with a corresponding deficiency. As would be expected, the blocks with the greatest deficiencies in long-term parking are those with large office buildings.

TABLE V - 18

SPACE HOUR PARKING SUPPLY AND DEMAND, SURPLUS AND DEFICIENCY

	SHORT TERM				LONG TERM			
Block Number[a]	Supply	Demand	Surplus	Deficiency	Supply	Demand	Surplus	Deficiency
19	25.6	18.0	7.6		25.6	8.8	16.8	
20		7.5		7.5	285.6	17.3	268.3	
25		8.0		8.0	152.0	13.0	139.0	
26					278.4		278.4	
27	76.8		76.8		136.0	23.4	112.6	
28	21.6	124.7		103.1	357.6	39.2	318.4	
29	208.8	314.7		105.9	104.0	382.4		278.4
30	302.4	658.6		356.2	4213.6	1125.1	3088.5	
31	295.2	204.2	91.0		226.4	94.7	131.7	
32	379.2	344.8	34.4		95.2	378.0		282.8
33	172.8	167.6	5.2		296.0	538.0		242.0
34	270.4	43.2	227.2		501.6	66.7	434.9	
35	127.2	39.4	87.8		783.2	57.0	726.2	
36		75.6		75.6	494.4	29.6	464.8	
37	266.4	159.8	106.6		88.0	85.7	2.3	
38	424.8	183.8	241.0		329.6	125.4	204.2	
39	424.8	469.7		44.9	245.6	441.0		195.4
40	696.8	499.7	197.1		120.8	421.7		300.9
41	496.8	484.1	12.7		89.6	585.0		495.4
42	696.8	851.8		155.0	553.6	686.3		132.7
43	509.6	7.8	501.8		1320.0	7.1	1312.9	
44	93.6	274.0		180.4	82.4	565.1		482.7
45	611.2	847.2		236.0	209.6	1114.3		904.7
46	512.8	557.3		44.5	60.0	1623.8		1563.8
47	753.6	358.2	395.4		77.6	643.1		565.5
48	383.2	127.5	255.7		289.6	251.0	38.6	
49	230.4	40.8	189.6		841.6	590.1	251.5	
50	7.2	16.5		9.3	128.0		128.0	

TABLE V - 18 (Continued)

Block Number[a]	SHORT TERM Supply	Demand	Surplus	Deficiency	LONG TERM Supply	Demand	Surplus	Deficiency
51	321.6	66.3	255.3		384.0	133.1	250.9	
52		3.5		3.5	208.0	24.7	183.3	
53	14.4	28.8		14.4	840.8	75.0	765.8	
54	280.8	557.1		276.3	456.0	1431.3		975.3
55	410.4	458.0		47.6	408.0	263.2	144.8	
56	621.6	585.4	36.2		394.4	455.3		60.9
57	264.0	57.7	206.3		140.0	99.5	40.5	
58					613.6		613.6	
59		10.7		10.7	432.0		432.0	
60		27.8		27.8	416.0	8.0	408.0	
61					144.0		144.0	
62		16.1		16.1	152.0		152.0	
63	127.2	11.9	115.3		64.0	16.0	48.0	
64	183.2	59.4	123.8		144.0	193.5		49.5
65	261.6	30.9	230.7		292.0	10.7	281.3	
66	396.0	98.0	298.0		235.2	68.4	166.8	
67	106.4	13.3	93.1		773.6	4.9	768.7	
68		16.8		16.8	120.0		120.0	
70								
71					80.0	24.0	56.0	
72		5.3		5.3	157.6		157.6	
73						12.9		12.9
74					132.0		132.0	
75								
TOTAL	10,975.2	8931.3	3788.6	1744.9	18,972.8	12,733.3	12,782.4	6542.9

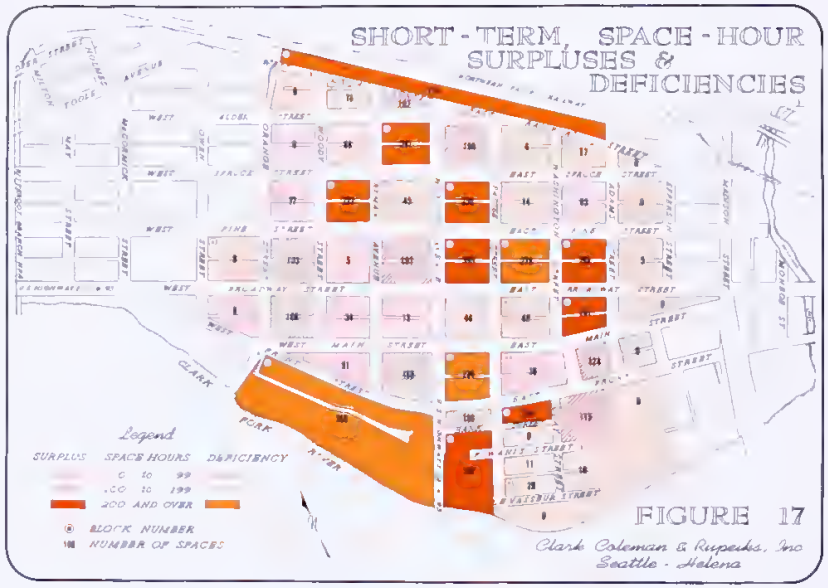
[a]See Figures 17 and 18

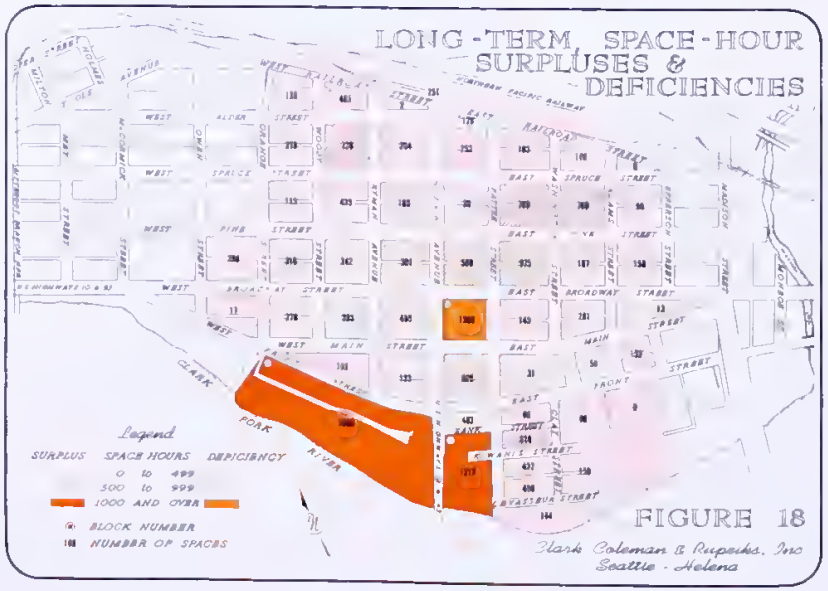
Source: Clark, Coleman & Rupeiks, Inc.

If the parkers in the CBD are willing to walk long distances between the place of parking and the primary destination, there would be no need for any additional parking. However, it was found that the average walking distance for shopping amounted to 308 feet and for work purposes to 612 feet. For this reason, a deficiency in one block may easily be offset by a surplus in a block some distance away. In the analysis, the short-term parking deficiencies were balanced with the surplus within a one-block area while the deficiencies in long-term parking were balanced with the surplus within a two-block area.

Despite the balancing of parking surplus with deficiencies within an area defined by walking distance, a deficiency of parking space still remains. The two block area bounded by Main, Pattee, Front and Ryman and the block bounded by Ryman, Front, Higgins Avenue and the river, are deficient of short-term parking by 703 space-hours. Converting this figure into off-street parking spaces results in the parking need of 104 short-term off-street parking spaces. Figure 19 shows the areas and amounts of parking needed.

The three block area bounded by Pine, Higgins, Broadway, Pattee, Main and Ryman is deficient in long-term parking





by the amount of 1,621 space hours. Converting this figure into off-street parking spaces results in a parking need for 203 long-term off-street parking spaces.

Summary of CBD Parking

The inventory of parking of all curb and off-street facilities has provided the accounting in terms of number, location and control of the total parking supply available in the central area. The earlier interview survey provided the vital information on parking demand and characteristics. Parking characteristics such as parker approach and direction, accumulation, space usage, turnover, durations, trip purpose, walking distance, truck parking and parking meter revenues are vital to relating parking demand to the available supply to determine the deficiencies or surplus of parking.

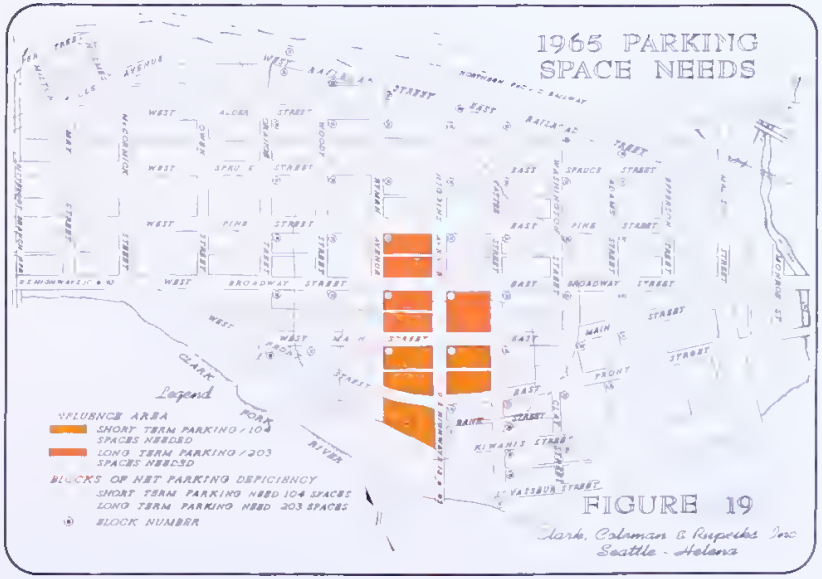


FIGURE 19

The Missoula CBD had a 1965 parking need of 104 short-term and 203 long-term off-street parking spaces. Before locational and overall operating recommendations can be made, the future parking needs should be forecast. This will be covered in Chapter VI. Having determined the current and future parking needs, the recommendations will be coordinated with the CBD land use and traffic circulation plan and recommendations, covered in detail in Chapter IX.

UNIVERSITY OF MONTANA PARKING

The University of Montana, like most other state universities, has become a complex institution performing a variety of functions including instruction, research,

student activities and public service programs. These functions draw large numbers of individuals daily to the campus, primarily in private automobiles. The university has responded to daily automobile commuter demands and has provided on-campus parking for faculty and staff, students and visitors.

The purpose of including the study of campus parking in the overall transportation planning program is to determine first, the adequacy of the present parking supply to meet the demand and, secondly, the adequacy of the planned future supply for meeting the estimated future demand. If the on-campus parking supply does not meet the demand, parking will overflow onto nearby residential streets, creating numerous problems and degrading residential land values.

The study of campus parking has been limited to an area defined by the Clark Fork River, Arthur and Beckwith Avenues and the foot of Mt. Sentinel.

Current Parking Supply and Demand

The current parking supply on the campus has been inventoried and the type of control noted. The current demand will be determined through analysis of various data such as the origin and destination survey, on-campus auto registrations and from a field survey of on-campus parking space utilization.

The land area of the campus, excluding the land on the hillside, totals about 120 acres. About 21 acres of this land is in off-street parking use, providing a total of 2,210 parking spaces. Curb parking spaces along internal and adjoining streets total 581 spaces. The total on-campus parking supply thus amounts to 2,791 parking spaces. Figure 20 illustrates this supply.

Of the total 581 curb parking spaces, 526 are unrestricted, while the remaining 55 curb spaces are reserved for loading and unloading.

Of the total 2,210 off-street parking spaces, 1,855, or about 84 percent, are in open, unrestricted lots. About ten percent, or 224 off-street spaces are reserved for faculty, 67 spaces, or about three percent, are reserved for employees of the university and the remaining 64 spaces, or three percent, are reserved for visitors and for loading purposes. The off-street parking lots are located primarily on the periphery of the academic core, the farthest lot being about 2,000 feet from the center of the oval.

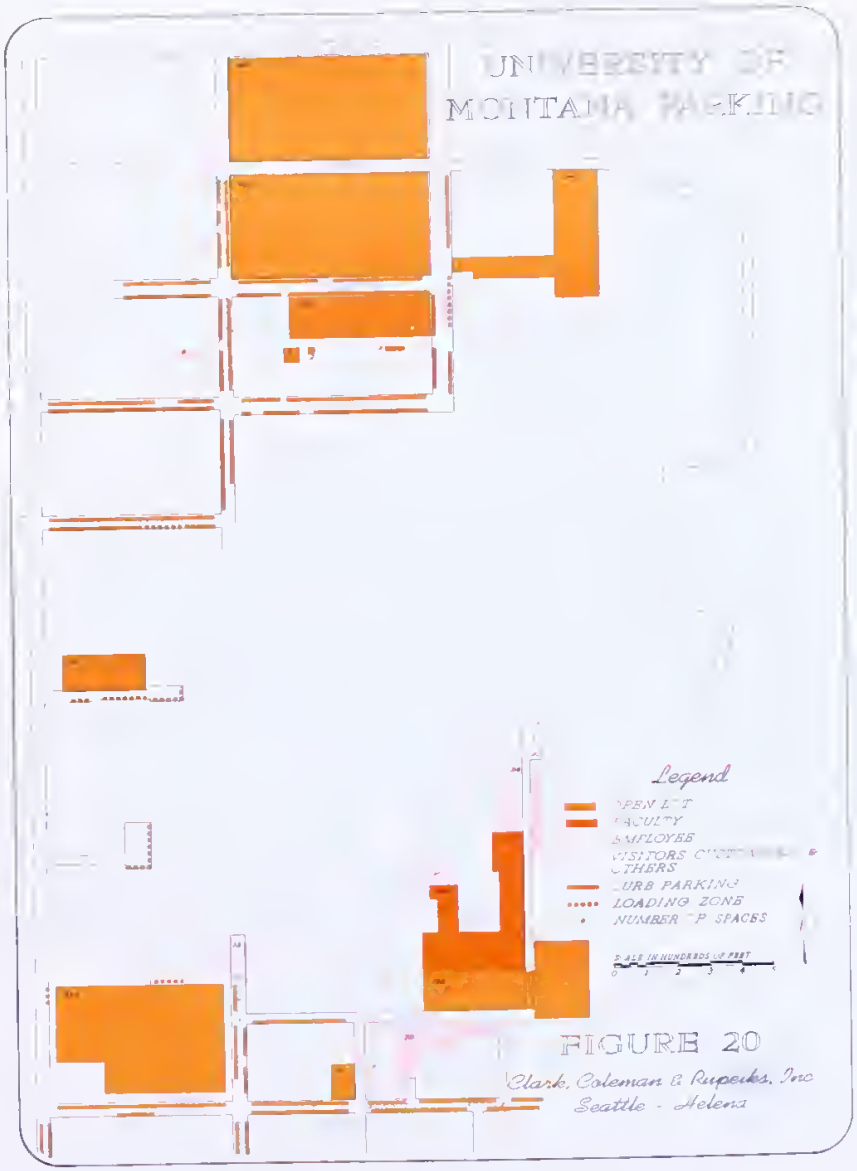


FIGURE 20

In the fall of 1965, a total of 10,253 vehicle trips originated and/or terminated on the university campus. Of these, a total of 1,577 vehicle trips were home connected work trips. The remaining 8,676 vehicle trips were made for other purposes. Of the total, 9,963 vehicle trips, or about 97 percent, were made by automobile and 290 trips, or about three percent, were made by truck or commercial vehicles. This parking usage resulted in a turnover of 1.8 vehicles per space. During the same year, about 5,500 registered students and 1,750 employees, a total of 7,250 persons, were making at least one person trip to the campus area. This results in about 1.67 vehicle trips per employee and about 1.34 vehicle trips per student for a combined total of 1.42 vehicle trips per person.

In the winter of 1967, the utilization of parking spaces on the campus was observed. On a typical weekday, a total of 1,736 vehicles, were observed occupying parking spaces on the campus between 9:00 a.m. and 12:00 noon. A total of 1,365 vehicles occupied parking spaces between 12:00 noon and 1:00 p.m. The occupancy rose to 1,461 vehicles between 1:00 p.m. and 4:00 p.m. In the morning, unrestricted curb spaces were 88 percent occupied while the occupancy of off-street spaces amounted to 56 percent.

The northernmost open parking lot, providing 400 vehicle parking spaces, went unused throughout the day.

No apparent parking problem exists on the campus of the University of Montana at this time. The current parking supply adequately meets the demand providing that students, faculty, staff and visitors are willing to walk from 1,000 to 2,000 feet between their primary destinations and places of parking.

Future Parking Supply and Demand

The Long Range Campus Plan recommends development of about 15 acres in off-street parking or about 2,500 off-street spaces. The Plan makes no mention of curb parking but the nature of the site plan tends to indicate that all curb parking will be eliminated. The total on-campus parking supply for the year 1975 has been estimated to range from 2,200 to 2,500 off-street spaces. Since no plans beyond 1975 have been made, it will be assumed here that the 1985 on-campus parking supply will amount to 2,200 to 2,500 off-street spaces.

The Long Range Campus Plan forecasted the 1975 student enrollment at about 8,950. The faculty and staff in 1975 has been estimated at 2,150. The on-campus parking demand in 1975 results in about 2,900 to 3,400 off-street spaces.

In 1985, the student enrollment is estimated at 13,200 and the faculty and staff at 2,550. The resulting on-campus off-street parking demand is thus conservatively estimated at 3,800 to 5,200 spaces.

The obvious conclusion is that the planned parking supply on the campus, amounting to 15 acres and resulting in 2,200 to 2,500 off-street spaces, will not adequately meet the parking demand in 1975 or in 1985. The net parking space deficiency in 1975 will range from a low of 400 spaces to 1,200 spaces. The net parking space deficiency in 1985 will result in a low of 1,300 to a high estimate of 3,000 off-street spaces.

Conclusions and Recommendations

The current on-campus parking supply of about 2,800 spaces quite adequately meets the current demand. The off-street lots are well located in relation to the academic core.

Assuming a continuation of the policy of unrestricted use and ownership of automobiles by students, the forecasted future parking demand greatly exceeds the available supply. A forecasted shortage of on-campus parking of 400 to 1,200 spaces will occur in 1975 and a shortage of 1,300 to 3,000 spaces in 1985. If no provisions for on-campus parking are made to accommodate the future excess demand, parking will overflow into the residential areas surrounding the campus.

It is recommended that the University of Montana prepare detailed estimates of its on-campus parking needs and explore and adjust their Long Range Plan to meet the needs. The avenues to explore are first, the development of more land for off-street parking lots, secondly, the development of multi-story parking structures at strategic locations, and third, the restricting of automobile use and ownership by students living in campus housing facilities. This apparent forthcoming parking problem should not be by-passed and the burden of providing additional supply should not be placed on the nearby residential home owners.

SHOPPING CENTERS PARKING

Suburban shopping centers are major traffic generators and should be considered in the development of an effective comprehensive transportation plan. In Missoula, three major suburban shopping centers now exist. Two are located south of the Clark Fork River along Brooks Street and one at the eastern city limits.

Tremper Shopping Center

Tremper Shopping Center is located on a 7.4 acre land area bounded by Russell, Brooks and Oxford Streets and Kent Avenue. The shopping center, because of its size and the merchandise offered, could be classified as a neighborhood convenience center. The retail outlets range from grocery stores to a variety store with a number of other smaller shops.

The current leasable building area measures about 107,000 square feet, resulting in a net land area devoted to parking and circulation of about 216,000 square feet. The center contains 402 marked parking spaces. Parts of the fringe area have not been striped for parking but could perhaps accommodate an additional 100 vehicles.

The ratio of building area to land area devoted to parking

amounts to 1 to 2.0. This results in a ratio of about 5.0 automobile parking spaces to 1,000 square feet of leasable building area. In operational practice and for development planning purposes, the provision of 5.5 car parking spaces per 1,000 square feet of gross leasable area is adequate as a standard to meet the demand. The Tremper Shopping Center approaches the standards in providing parking spaces in relation to the building area.

It is recommended that any additional building area provided in the shopping center be accompanied by a corresponding parking area at a ratio of 5.5 parking spaces per 1,000 square feet of new building area. The issuance of a building permit for additional building area should be contingent upon provision of additional off-street parking.

Village Shopping Center

The Village Shopping Center, bounded by Brooks and Bow Streets and Kent Avenue contains a junior department store, a grocery store and a number of other smaller shops. The gross land area amounts to about 8.4 acres, of which 2.4 acres, or about 102,000 square feet, are in leasable building area. The site contains about 700 marked parking spaces in the main parking area, 40 spaces in the rear of the buildings and 18 spaces reserved for employee parking.

The ratio of leasable building area to the land area devoted to parking amounts to 1 to 2.6. This results in a ratio of about 6.5 automobile spaces per 1,000 square feet of leasable building area. The amount of land area in parking is quite adequate in relation to the gross leasable building area and meets the practical standard of 5.5 automobile parking spaces per 1,000 square feet of leasable building area. The center can accommodate a limited amount of additional building area without provision of additional parking area. However, it should be kept in mind that the provision of any additional ground floor building area will result in a corresponding reduction in parking area. At the norm of 5.5 parking spaces to 1,000 square feet of leasable building area the center can accommodate an additional 12,000 square feet of building area.

Eastgate Shopping Center

Eastgate Shopping Center is located on a 5.9 acre tract bounded on the north by East Broadway, on the west by VanBuren Street and on the south by the Clark Fork River.

The Center is a neighborhood convenience type with retail outlets ranging from a variety store to a grocery store.

The current leasable building area amounts to about 77,000 square feet and net land area devoted to parking is about 179,000 square feet. The site contains about 450 marked spaces of which 50 are reserved for employee parking. Additional parking on the site could be developed east and west of the building area and on the fill between the structure and the river.

The ratio of leasable building area to land area devoted to parking amounts to 1 to 2.3. This results in a ratio of about 5.8 automobile parking spaces per 1,000 square feet of leasable building area. Without the extension and development of the fill area for parking, the Eastgate Shopping Center should not add any building area on the site.

PARKING ON HIGGINS AVENUE SOUTH

Severe parking problems sometimes can occur in outlying or fringe business districts. Parking and moving automobiles are competing for space along Higgins Avenue South between Third and Brooks Streets. The 55-foot curb to curb pavement section accommodates four travel lanes and two curb parking lanes. Left turns on Higgins Avenue during peak travel periods are prohibited. The crowding of four narrow travel lanes and two curb parking lanes results in congestion limiting the effectiveness of the Higgins Avenue Bridge to an equivalent of two travel lanes. An abnormal number of side swipe traffic accidents are occurring throughout this section. The obvious solution of prohibiting curb parking results in failure of business activity thus defeating the intent of the solution.

Currently, curb parking between Third and Brooks Streets contains 52 spaces with a two-hour parking limitation. Off-street lots on both sides of Higgins, one block deep, provide a total of 167 spaces for customers and employees. There are two used car lots occupying the equivalent of about 50 customer parking spaces. Certain land areas also exist that could be developed into off-street customer lots amounting to an additional 75 spaces.

It is recommended that the businesses along this section of Higgins Avenue form a local improvement district, assess themselves and develop an area wide off-street parking program. The businesses that already own and operate off-street lots may contribute land in lieu of their assessment. The businesses that have relied entirely

on curb parking would be required to make a cash contribution. Curb parking eventually will have to be removed to allow four travel lanes and a median turn lane to be installed to accommodate the heavier future traffic loads.

AIRPORT PARKING

The airport is one of the most important and active single-site land uses in the Study Area. The airport provides a link with distant places and thereby can be the key to attracting new commerce and industry as well as tourism. In this light, the economic impact of the airport upon the Missoula area is much greater than is measurable by the number of passengers it serves or by the jobs available on its premises.

Currently, Montana is served by Northwest Airlines as the only scheduled air travel service. There are a total of four flights a day, two eastbound and two westbound. Approval of the Frontier Airlines application for north-south travel through Missoula is expected shortly. Northwest Airlines is also planning additional flights on their east-west route.

On the airport premises there are 108 parking spaces devoted to customers, 19 spaces for employees, 16 spaces for loading and two spaces for taxis or a total of 145 parking spaces. On a typical weekday, at the time of arrival of a Northwest Airlines flight, the parking area was 80 percent occupied. Ninety-five of the customer spaces and twenty of the restricted spaces were occupied.

Every expectation is that the dramatic growth of air travel will continue, if not accelerate. A reliable estimate is that air travel will triple by 1975. A corresponding requirement in parking spaces at the Missoula airport is estimated to amount to about 450 spaces by 1975 and about 700 to 900 spaces by 1985. At present there is ample land area available to provide the additional parking. However, the future parking land area requirements should be kept firmly in mind in the development of additional structures and hangar facilities to insure availability of space for parking when the need arises. It is imperative that a long range master plan for the development of the Missoula Airport be prepared at the earliest date giving proper consideration to traffic circulation and parking facilities.

RAILROAD, BUS AND TRUCK TERMINALS

In person travel, railroad and bus terminals are points where change of travel mode takes place. If the change of travel mode is to or from the automobile, the terminal facilities should provide adequate parking for automobiles. In the goods movement sector, the railroad, bus and truck terminals are the transfer points requiring facilities for loading and unloading of commercial vehicles. It is the purpose of this section to investigate and evaluate the effectiveness of these terminal facilities to insure that the change of mode in person travel or the transfer in the goods movement takes place effectively and conveniently without creating traffic congestion.

Railroad Terminals

Missoula is served by two continental railroads, the Chicago, Milwaukee-St. Paul and Pacific line and the Northern Pacific line. The Northern Pacific line provides passenger service twice a day in east and west direction while the Milwaukee line only provides freight service.

The passenger loading takes place at the Northern Pacific passenger terminal located at the northern end of Higgins Avenue. The average daily passenger service in Missoula amounts to about 70 passengers and is declining. There is adequate curb and off-street parking available in the vicinity of the passenger terminal. No traffic congestion nor passenger-vehicle conflicts are experienced now nor is there any indication that this may become a problem in later years.

The Chicago, Milwaukee, St. Paul and Pacific Railroad freight terminal is located on the south bank of the Clark Fork River, west of Higgins Avenue Bridge. There is ample loading and storage space available at the terminal and no apparent congestion problems are anticipated on the site nor on the access streets.

The Northern Pacific Railroad freight loading and unloading facilities are located on the north side of Railroad Avenue between Owen and Woody Streets. The loading site contains 17 truck loading bays accommodating on an average of 55 trucks per day. Loading and unloading takes place continuously throughout the 24 hour period. At present, the loading facilities are adequate and there exists no apparent traffic congestion problems. The facilities are judged adequate for many years to come and no apparent traffic congestion difficulties are anticipated.

The Northern Pacific Railroad's livestock loading takes place north of the tracks along Raeser Drive. Considerable congestion is created by semi-trailer trucks backing up to the Missoula Livestock Yard gates to load livestock, thus blocking one travel lane along Raeser Drive. The congestion, however, occurs at random intervals and is not continuous. The expenditure necessary to widen the street or to move the loading to some other place makes either alternative questionable. If conditions were to become intolerable it should be the responsibility of the Missoula Livestock Yard to provide added street capacity or to relocate the loading of livestock to an area where the trucks do not interfere with local or through traffic.

Intercity Bus Terminal

Intercity passenger and limited goods movement in Missoula is provided by the Greyhound Bus Lines. A total of eight bus stops are provided in Missoula with an average passenger load of 28 per trip. Conditions at the present bus terminal, located along the north side of Broadway between Ryman and Higgins Avenue, are crowded and, as a result, the Greyhound Bus Lines is considering relocating and building a modern spacious terminal somewhere along Higgins Avenue north of Pine Street. The otherwise apparent automobile congestion at the bus terminal is relieved by the adjoining metered off-street parking lot in the rear of the terminal. Two other bus lines, Intermountain and a Northern Pacific line to the Bitterroot Valley make a total of six stops and serve about 30 passengers per trip.

No traffic congestion problems are anticipated with the relocation of the terminal, provided proper passenger and goods loading facilities are made part of the development.

Truck Terminals

In Missoula, the major truck terminals are the Consolidated Freightways, the Garrett Freightlines, Inc., the United Buckingham Freight Lines and the Pacific Intermountain Express.

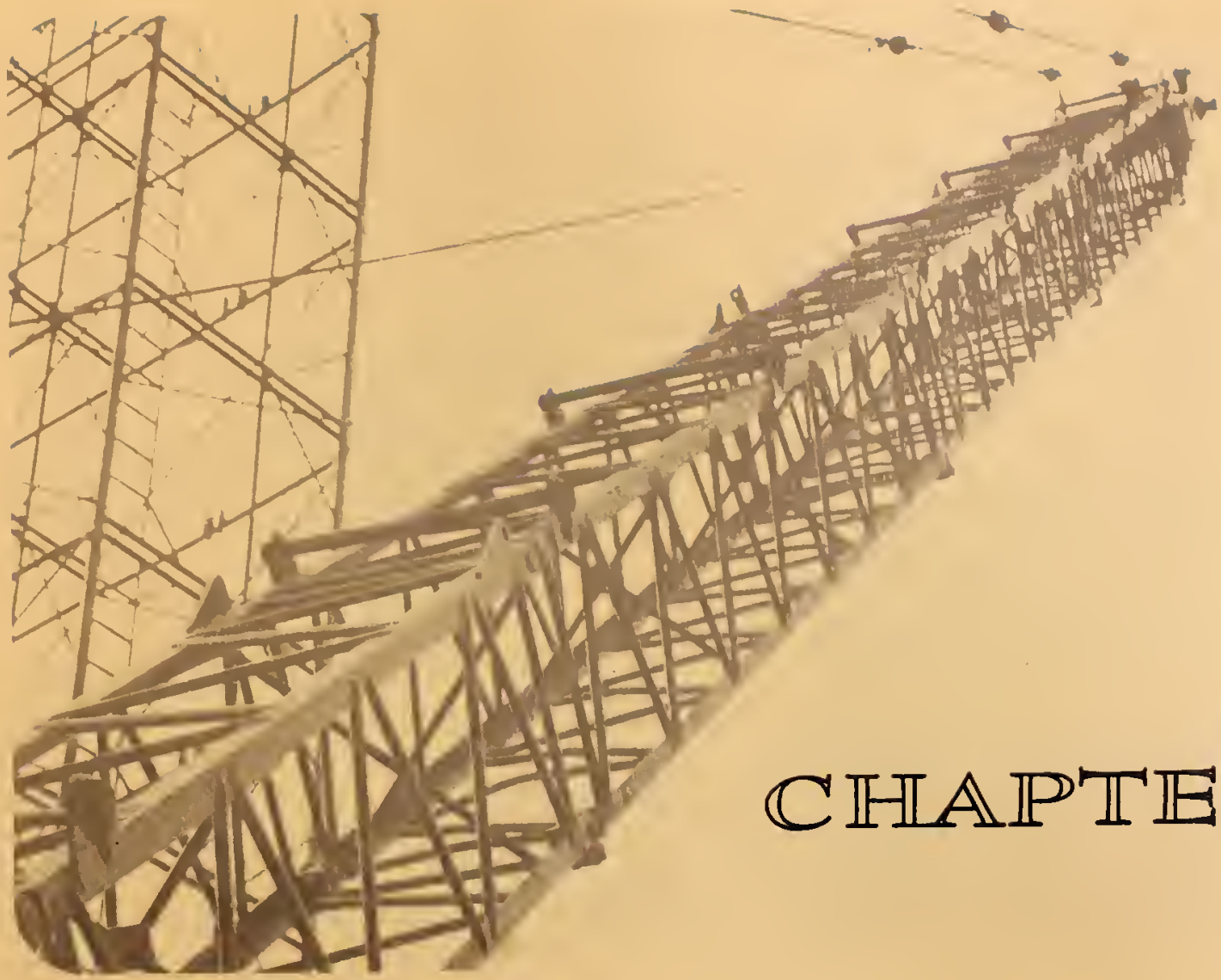
The Consolidated Freightways, the Garrett Freightlines, Inc., and the United Buckingham Freight Lines are all located in the northwestern part of Missoula along Cooley Street between Burton and Burns Street. The Consolidated facilities provide 14 loading bays and handle an average

volume of 20 trucks per day. The Garrett facilities provide a total of 12 loading bays and handle a total of about six trucks a day. The United Buckingham facilities provide eight loading bays and handle a total volume of about 16 trucks per day. Loading and unloading takes place throughout a 24 hour period, thus creating negligible traffic congestion.

The Pacific Intermountain Express facilities are located west of Missoula along U. S. Highway 10 between Palmer and Turner Streets. The facility provides ten loading bays on a five acre site. The typical weekday load amounts to about 12 trucks. The peak unloading takes place between 4:00 a.m. and noon and the loading between 2:00 and 6:00 p.m.

All truck terminals in Missoula are well located and have adequate facilities and land area available to meet the increasing needs of the future. However, Lincoln and Cooley Streets should be improved to facilitate heavy truck loads. The cost of improvement should be borne by the citizens of Missoula. The City is fortunate to have three major truck terminals confined to one area. If they were dispersed, it would become a great burden on the citizens of Missoula to maintain three independent truck terminal access routes in proper operating condition.

Ordinance No. 896, adopted August 24, 1959, authorizes the City Council to restrict truck traffic to certain selected city streets, designated as truck routes. Currently almost all arterial streets have been designated as truck routes. The suggested revisions in the truck route system will be discussed in the transportation plan chapter of this report.



CHAPTER 6

CHAPTER VI FORECAST OF URBAN DEVELOPMENT AND TRAVEL

The development of an urban transportation plan is properly founded on a detailed estimate of future travel. The volume of such travel is determined by the population and economic activity of the area, and the patterns of travel are defined by the dispersal and intensity of the land development.

The forecasts of socio-economic activity, land use and travel are presented in this chapter, accompanied by a discussion of the assumptions and procedures on which the forecasts were based. Both total and spatially dispersed forecasts have been made for the Missoula Urban Area.

CONSIDERATIONS IN FORECASTING

Often, forecasting involves preparation of a range of estimates based on different assumptions of socio-economic factors and land development patterns. From the viewpoint of transportation planning, it is preferable to concentrate on the most probable estimate. This provides a forceful statement of the transportation problem and concentrates attention on finding workable solutions. The target year for making forecasts was set at 1985.

Forecasting is not an exact science. The reliability of forecasting, other than comparing actual conditions with the forecast at the target year, is based on the assumptions and techniques used and the soundness of the basic data. The following paragraphs explain the procedures followed, the data utilized and the assumptions made in forecasting. This description provides the means of evaluating the results.

All forecasts will be made for the Study Area which includes all Missoula's present urban land and all additional land areas likely to be in urban use by the forecast year. There is a large degree of stability in forecasts resulting from the size of population and the urbanized area already in place. Almost two-thirds of the expected 1985 population is presently here. Nearly one-third of the developable land inside the Study Area is in current use. This large commitment, entailing great investments in structures and utilities, must continue to represent the key portion and is a major determinant of the 1985 land development pattern. What is already here in people and development is extremely important because growth is nothing more than additions of small increments and departures from the existing pattern.

SOCIO-ECONOMIC FORECASTS

The forecaster who undertakes to determine the future of an area must accept certain general underlying assumptions. These include a prospering economy and a stable government. At the local level, it is assumed that Missoula will be subject to trends toward urbanization and industrialization observed across the United States, that major access routes contributing to past growth will continue to exist and that the University of Montana will be faced with expansion due to the larger demand for higher education.

Atop these assumptions are considerations of past population and economic growth, the current situation as compared with past trends and limitations on future development imposed by the land. The evolved uses of the land and the thoroughfare network are also important considerations.

The expected state population for 1985 was first needed before a Study Area forecast for that year could be made. The Series II-B forecast for Montana made by the United States Bureau of the Census, adjusted by the State Planning Board's estimates for 1960 to 1965, produced the State's 1985 projected population. To arrive at the Study Area estimate, the "step-down" method was used; that is, the expected relationship of Region to State, County to Region and Study Area to County, based on past trends.

Population

An increase of 182,000 over 1965 for a total of 887,000 persons by 1985 is anticipated for the State of Montana. The Region's share of this, an estimated 13.6 percent by 1985, would amount to 120,700 persons. Missoula County's estimated 1985 population is 78,200, an increase of 27,970 persons over 1965. The 1985 estimate for the County means an increase to 64.8 percent of the total Region and to 8.8 percent of the State.

Assuming a continuation of the trend toward centralization of population within the County, the Study Area is likely to increase to 73,500 persons by 1985. A gain of approximately 27,000 over 1965, the new population will represent an estimated 94 percent of the County, nearly 61 percent of the Region and 8.3 percent of the State. The forecast for the Study Area means an average annual gain of 1,350 persons or 2.9 percent per year. Figure 21 is an illustration of present and future projected population in the Study Area.

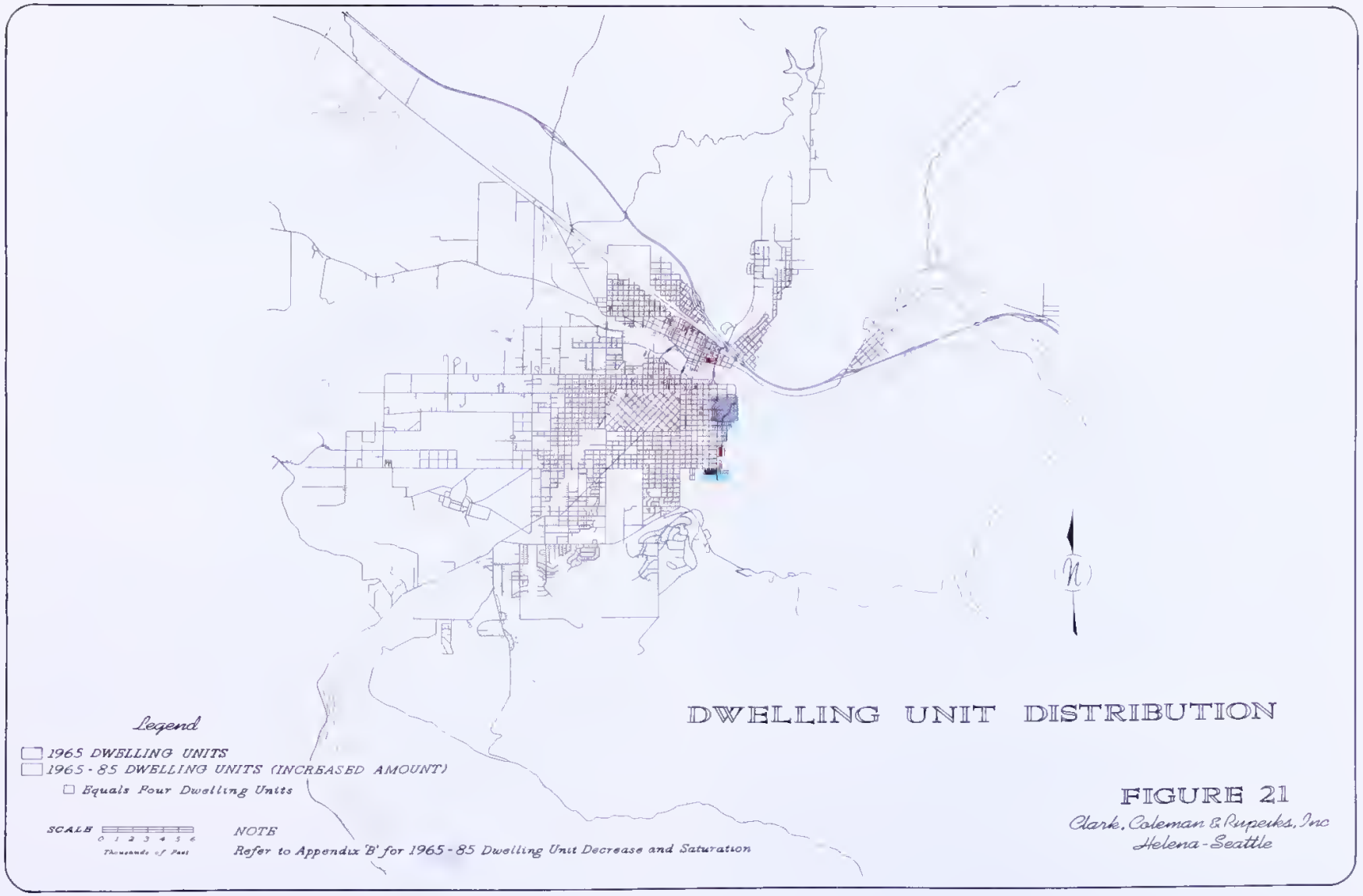


FIGURE 21

Clark, Coleman & Rupeiks, Inc
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The new residents anticipated in the Study Area will require 6,900 new housing units added to the current inventory. A total of 23,369 units will be needed by 1985, of which 4,369 will be in university housing. The forecast of 1985 population by dwelling unit structure type is given in Table VI-1.

The anticipated growth of the University of Montana is a major factor in the increase expected in the Study Area. By 1985, the University is expected to enroll 13,200 students, an increase of 7,708 over 1965, assuming a continuation of the trend toward a larger number of State university students enrolled per 1,000 population.

TABLE VI - 1

STUDY AREA POPULATION BY DWELLING UNIT STRUCTURE TYPE, 1985

	1965-85 Increase	1985 Total	Percent
Trailer	644	1,929	3.0
Single-family	16,965	52,820	81.5
Duplex	1,651	4,600	7.1
3 and 4 units	854	2,135	3.3
5 - 20+ units	995	2,260	3.5
Rooming House	43	145	.2
Hotel	86	256	.4
Motel	150	475	.7
Institutional	65	200	.3
TOTAL[a]	21,453	64,820[b]	100.0

[a]Non-university

[b]Excludes 8,680 in dormitories and married students and their dependents

Source: Clark, Coleman & Rupeiks, Inc.

Employment

No major changes are foreseen in the economy of the Missoula Study Area during the twenty years. Expectations are that those factors which have stimulated and sustained the Area's economic growth in the recent past will remain operable in the future.

Missoula County employment is expected to increase to 28,440 workers by 1985, a gain of 10,200 workers in the planning period. This anticipated gain of an average 2.8 percent annually is somewhat less than the 3.5 percent per year increase experienced during the twenty years prior to 1960.

Total employment in the Study Area is expected to reach 24,320 by 1985, an increase of 9,100 workers, or about 450 new employees annually. In both the Study Area and the County, the share of the total population included in the labor force is expected to remain essentially the same in 1985 as it had been in 1965. The forecast of 1985 Study Area employment by industry is given in Table VI-2.

Employment within Missoula's CBD is forecast at 8,100 persons, representing a twenty-year gain of 56 percent. The 1985 Study Area employment outside the CBD, some 16,220 workers, means a 62 percent growth over 1965. Present and anticipated future employment for the Study Area are shown in Figure 22.

Land Use Forecast

The new residents expected in the Study Area will require land for their homes; the new employees in both commerce and industry will need additional space in which to work. An estimate of how much new land is needed for each function is made in the land use forecast. The Land Use Plan, shown in Figure 23, suggests the locations for required land. The added population, however, generates a demand for new public facilities as well as for residential land. Standards have evolved over the years regarding the size of schools, parks and other facilities. Efficiency and economy dictate a location for these uses close to the neighborhood served or, if the facility is shared by the entire community, easily accessible and otherwise conveniently situated. The Community Facilities Plan, Figure 24, shows the proposed locations of public facilities required by the 1985 Study Area. These two plans, land use and community facilities, are necessary to formulation of a Transportation Plan, but the reverse is also true. The formulation of a

TABLE VI - 2

FORECAST OF 1985 STUDY AREA AND CBD EMPLOYMENT

	CBD		STUDY AREA	
	1965-85 Change	1985 Total	1965-85 Change	1985 Total
Construction	41	120	280	980
Manufacturing	--	249	1,380	3,380
Trans., Comm., Util.	326	1,003	720	2,120
Government	723	1,632	2,240	5,940
Wholesale Trade	65	178	335	860
Retail Trade	460	1,680	1,525	4,700
Fin., Ins., Real Estate	285	741	580	1,230
Services	1,015	2,497	2,060	5,110
TOTAL	2,915	8,100	9,120	24,320

Source: Clark, Coleman & Rupeiks, Inc.

EMPLOYMENT DISTRIBUTION

FIGURE 22

Clark, Coleman & Rupeiks, Inc
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community development plan requires a coordination of the three elements. The forecast of 1985 acreage requirements of types of land uses is shown in Table VI-3.

Residential Land. On the basis of the existing residential development density of five dwelling units per acre, an additional 1,366 acres of land will be required by 1985.

TABLE VI - 3

FORECAST OF 1985 LAND USE

	1965-85 Increase[a]	1985 Total
Residential	1,366	3,985
Single-family	1,259	3,670
Duplex	23	68
Multi-family	27	78
Motels, hotels	12	37
Mobile homes, etc.	45	132
Non-residential	2,723	7,380
Commercial	222	538
Manufacturing	369	969
Tran., Comm., Util.	257	756
Public (incl. schools)	1,875	5,117
TOTAL	4,089	11,365

[a]In acres

Source: Clark, Coleman & Rupeiks, Inc.

The total residential land needed in that year is an estimated 4,000 acres.

The Land Use Plan has proposed that in the CBD, and the area immediately south across the Clark Fork River and near the University, the residential land use change from predominantly single-family to include duplex and apartment development. Within the CBD and along the eastern edge of the University, high density multi-family development has been suggested to accommodate increased residential demand in those areas. About 146 acres are expected to be in multi-family residential use by 1985, an increase of 96 acres.

Figure 23 shows the large amount of Study Area, some 3,670 acres, proposed for single-family use in 1985. The acreage represents an increase of 1,260 acres over the existing total and an estimated 92 percent of 1985 residential land. Generally, the high density single-family use, containing from eight to ten dwelling units per acre, is proposed as a transition zone from less intensive to more intensive use. This use appears in the more developed areas of the City, accessible by arterials, closer to the CBD and containing elementary school facilities. The medium density single-family use proposed by the Land Use Plan with five to seven dwelling units per acre, usually borders the higher density neighborhoods and is somewhat further from the central business area.

The low density residential areas, with two to four dwelling units per acre, have been proposed in areas where existing development is newer and accessibility is less ready. The new elementary schools and community arterials planned for these areas are expected to give impetus to development. The Department of Health has placed density limits on some of the land because of sewage drainage problems and the topography has also limited development. The resultant large residential lots and view provided by the terrain are, however, expected to inject popularity into these areas for low density residential use.

Finally, suburban densities of up to two dwelling units per acre have been suggested in the Hellgate, Miller Creek and Pattee Canyon areas where services are scarce and access is limited. The terrain of the Study Area places effective limits on the outer edges of the land that can develop in this density, but the view and scenic environment for the isolated homes built will be accented by arterial expansion proposed.

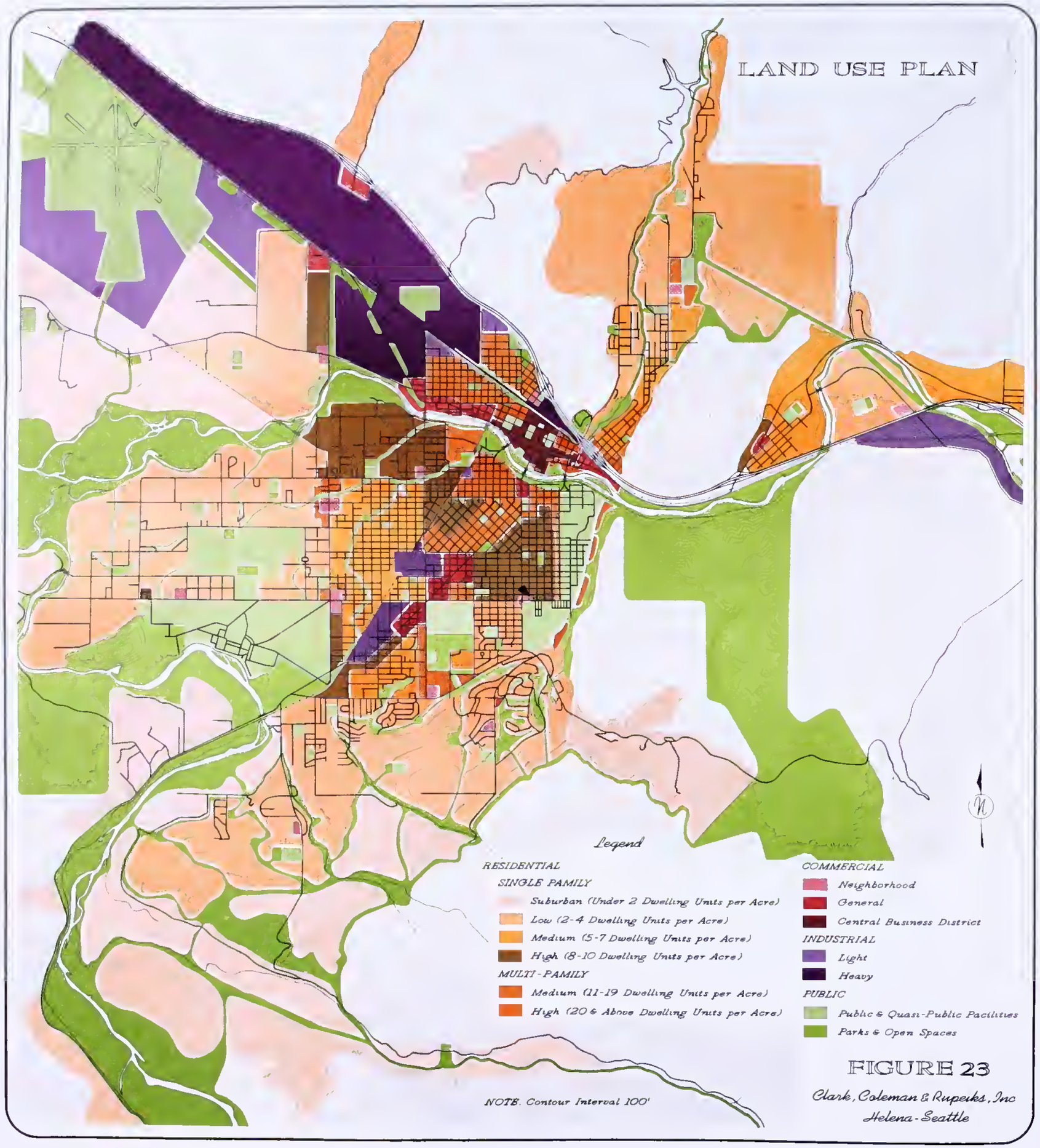

FIGURE 23

Clark, Coleman & Rupeiks, Inc
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Commercial Land. To determine 1985 requirements for non-residential land, the number of employees working in an industry was divided by the number of acres used by that industry. The 1985 forecast was based upon the anticipated increase in employment and upon the assumption that average employment densities would not change drastically in the twenty years. Land in commercial use was thus estimated at 538 acres by 1985, an increase of 203 acres over 1965.

The Land Use Plan proposed three types of commercial land: CBD, general and neighborhood. The first type is largely self-explanatory as containing the bulk of offices, business and professional services, and the pedestrian-oriented retail outlets such as department stores, apparel and specialty shops. The general commercial area, located along a main thoroughfare and also containing outlets appealing to the whole population, is intended for occupation by automotive sales, hotels and motels, restaurants and other highway-oriented businesses. The Land Use Plan proposed general commercial land on all four sides of the CBD, along the major thoroughfares leading into the core area as shown in Figure 23. South along Brooks Street between Mount and Minneapolis, in East Missoula and along Reserve Street, general commercial areas are also recommended.

A third designation, neighborhood commercial, follows the outward spread of population, locating near customers and offering necessity items like food, drugs and gasoline. The neighborhood commercial centers proposed by the Land Use Plan, a total of ten, are located adjacent to community arterials to prevent residential disruption from the generated traffic.

Industrial Land. In the industrial category, encompassing manufacturing, wholesaling and construction, a demand for 369 additional acres is expected, bringing the total in use to 969 acres by 1985. In addition to the 499 acres now used by transportation, communications and utilities, another 257 acres will likely be needed for a total of 756 acres.

Within the city limits, the Land Use Plan has suggested land for industry along the Northern Pacific's Bitterroot Branch and in two small areas north of the Clark Fork River west of the CBD. Because position along major rail and arterial routes is so important to industry, sufficient acreage for many decades to come has been provided near the County

Airport and along the Northern Pacific route north to Interstate 90 in the northwest section of the Study Area.

Community Facilities and Open Space. The growth of the Study Area's population and the outward spread of residents into suburban areas will necessitate the addition of public facilities. A requirement for 1,875 new acres of public and quasi-public land is expected, bringing the total in that use to nearly 5,000 acres by 1985.

With an increase in public school enrollment of 6,421 students, for a 1985 total of 17,814, much of the public land use increase will be accounted for by new elementary schools and high schools. Approximately 407 new elementary classrooms and 76 additional acres will be needed, or ten new schools and additions on seven existing facilities. At the high school level, a 1985 demand for 257 classrooms, or five high schools, and 48 additional acres are expected. Figure 24, the Community Facilities Plan, gives the location of existing and proposed Study Area schools.

The growing population will also require other services such as fire stations, utilities and public buildings to house local, state and federal government employees. The Community Facilities Plan has suggested new structures and sites for the City Hall, the library and the Community Hospital, as well as locations for several new fire stations and for the County shops. A vocational-technical school has been proposed for the site currently occupied by the County fairgrounds. The fairgrounds have been proposed for relocation to the Fort Missoula site to form a civic and sports complex with the indoor fieldhouse and outdoor stadium also suggested on the site. The airport has been proposed for expansion to the northwest to accommodate jet traffic and to the southeast for additional landing clearance.

The projected Study Area population will require 734 acres of developed parkland, or 294 acres over the existing inventory. At accepted park standards, neighborhood parks and playgrounds will need 165 acres of the total; community parks and playfields, 184 acres; and major parks and recreation areas, 385 acres. As shown in Figure 24, the Community Facilities Plan has recommended, for the most part, that neighborhood parks be adjacent to elementary schools and community parks to high schools, in both cases for more efficient and economical use.

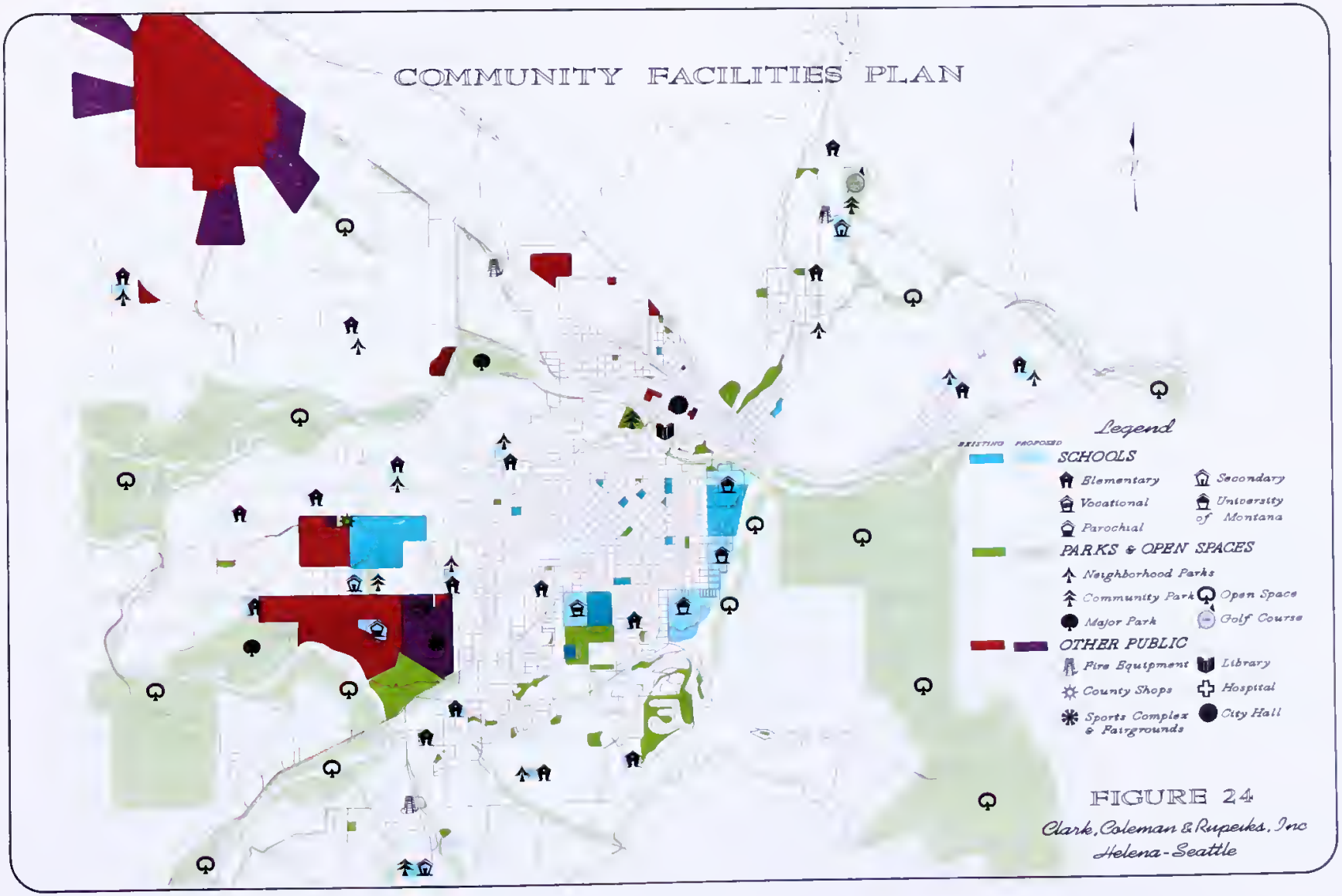

FIGURE 24

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The open space system, noted in the figure, dwells heavily on a clean, open waterfront throughout the Study Area. A concentrated effort toward development of Missoula's many historic points of interest is also urged.

The Land Use and Community Facilities Plans are intended to provide sufficient space for each use, based on estimated demand, compatible with adjacent uses to preserve land values and environmental features of the Study Area. In conjunction with the Transportation Plan these intentions can be realized.

Vehicle Ownership

An integral part of urban growth and activity has been the increased mobility of the population resulting from increased automobile ownership and usage. The low-density character of urban growth and the declining service provided by transit, because of its inability to operate economically in large areas of low-density development, has given impetus to the trend toward increasing dependence on the automobile.

Missoula County has experienced a moderate population growth of about 26 percent between 1950 and 1960. At the same time, vehicle ownership increased about 56 percent, more than twice the rate of population. The increased rate in per capita vehicle ownership had a direct influence on travel. As the vehicle ownership per family increased, more vehicle trips were made. If this trend, or a modification of this trend were to continue into the future, per capita rates of vehicle trip making would likely continue upward.

The predominantly agricultural and natural resources oriented economy of the State of Montana has resulted in high per capita ownership of commercial vehicles. In 1965, there was one registered commercial vehicle for every 5.2 people, whereas in the entire United States, there were 12.9 people for every registered commercial vehicle. In the State, as well as in Missoula County, the proportion of commercial vehicles of the total registered vehicles has held amazingly constant throughout the past years. Commercial vehicles as a percent of total registered vehicles in the State amounted to about 30 percent and in Missoula County to about 21 percent. The national average was between 15 and 18 percent.

A forecast of vehicle ownership for the United States, State of Montana, Missoula County and the Study Area was

prepared and is shown in Table VI-4. Some forecast data were available for the United States and the State of Montana. All forecasts for the Missoula County and the Study Area were based on past data. The forecast trends in the Study Area were compared to the forecast trends in the County, the State and the United States. In Missoula County, an increase in per capita passenger automobile is anticipated, projected at a diminishing rate of increase and resulting in 2.0 persons per passenger vehicle in 1985.

The Study Area's passenger automobile registration is estimated to increase from 20,299 vehicles in 1965 to 36,800 vehicles in 1985, an increase of about 82 percent over the twenty year period. The persons per passenger vehicle ratio is estimated to decrease from 2.3 in 1965 to 2.0 in 1985.

In 1965, the Study Area contained a total of 5,468 commercial vehicles. A majority of these commercial vehicles were found to be pick-up and panel trucks used primarily as the family's second automobile for person transportation. The travel characteristics of these trucks or commercial vehicles resemble those of the passenger vehicle. The 1985 estimated registration of all commercial vehicles amounts to about 9,200. The persons per commercial vehicle ratio is expected to decrease from 8.5 in 1965 to 8.0 in 1985. The percentage of commercial vehicles to total registered vehicles in the Study Area amounted to 21.2 percent in 1965 and is estimated to be about 20.0 percent in 1985.

Total registered vehicles in the Study Area are estimated to increase from 25,767 in 1965 to 46,000 in 1985, an increase of about 78 percent. The number of persons per registered vehicle is estimated to decrease from 1.8 in 1965 to 1.6 in 1985.

1985 CBD PARKING DEMANDS

This section covers the forecast of 1985 parking demand in the CBD. Of primary importance in the forecast are population, vehicle trips to the CBD and changes in land development and street circulation systems. The current parking needs in the CBD have been outlined in Chapter V and the plan for future improvements will be discussed in Chapter IX.

Population, Employment and Sales Trends

In 1965, the Study Area had a population 46,430 people. The population forecast indicates that the Study Area's

TABLE VI - 4

HISTORY AND PROJECTION OF MOTOR VEHICLES

	UNITED STATES[a]						STATE OF MONTANA[b]					
	1950	1960	1965	1970	1980	1985	1950	1960	1965	1970	1980	1985
Population	152	179	194	208	245	266	591	675	706	759	878	950
Decennial Population Rate of Growth in Percent	15.2	17.8	-	16.2	17.8	-	5.7	14.2	-	12.4	15.7	-
Passenger Vehicles	40	62	75	82	101	110	179	256	296	331	399	435
Persons per Pass. Vehicles	3.8	2.9	2.6	2.5	2.4	2.4	3.3	2.6	2.4	2.3	2.2	2.2
Decennial Pass. Vehicle Rate of Growth in Percent	48.1	55.0	-	32.2	23.2	-	25.2	43.0	-	29.3	20.5	-
Commercial Vehicles	9	12	15	17	19	20	80	112	137	140	175	194
Persons per Comm. Vehicle	16.9	14.9	12.9	12.2	12.9	13.3	7.4	6.0	5.2	5.3	5.0	4.9
Decennial Comm. Vehicle Rate of Growth in Percent	80.0	33.3	-	41.7	11.8	-	66.7	40.0	-	25.0	25.0	-
Total Vehicles	49	74	90	99	120	130	259	368	433	471	574	629
Persons per Total Vehicles	3.1	2.4	2.2	2.1	2.0	2.0	2.3	1.8	1.6	1.6	1.5	1.5
Decennial Total Vehicles Rate of Growth in Percent	53.1	51.0	-	33.8	21.2	-	35.6	42.1	-	28.0	21.9	-
Comm. Vehicles of Total Vehicles in Percent	18.4	16.2	16.6	17.2	15.8	15.4	30.9	30.4	31.6	29.7	30.5	30.8

[a]Population and vehicles expressed in millions

[b]Population and vehicles expressed in thousands

TABLE VI - 4 (Continued)

	MISSOULA COUNTY						MISSOULA STUDY AREA					
	1950	1960	1965	1970	1980	1985	1950	1960	1965	1970	1980	1985
Population	35,493	44,663	50,230	55,800	70,000	78,200			46,430	50,800	65,100	73,500
Decennial Population Rate of Growth in Percent	22.2	25.8	-	24.9	25.4	-			-	-	28.1	-
Passenger Vehicles	10,929	17,150	22,861	26,600	34,800	39,300			20,299	23,600	31,700	36,800
Persons per Pass. Vehicle	3.2	2.6	2.2	2.1	2.0	2.0			2.3	2.1	2.1	2.0
Decennial Pass. Vehicle Rate of Growth in Percent	28.8	56.5	-	55.1	30.8	-			-	-	34.3	-
Commercial Vehicles	2,951	4,431	6,701	7,400	9,200	10,700			5,468	6,300	8,100	9,200
Persons per Comm. Vehicle	12.0	10.1	7.5	7.6	7.5	7.4			8.5	8.0	8.0	8.0
Decennial Comm. Vehicle Rate of Growth in Percent	64.3	50.2	-	67.0	24.3	-			-	[illegible]	48.1	-
Total Vehicles	13,880	21,581	29,562	34,000	44,000	50,000			25,767	29,900	39,800	46,000
Persons per Total Vehicles	2.6	2.1	1.7	1.6	1.6	1.6			1.8	1.7	1.6	1.6
Decennial Total Vehicle Rate of Growth in Percent	35.0	55.5	-	57.5	29.4	-			-	-	33.1	-
Comm. Vehicles of Total Vehicles in Percent	21.3	20.5	22.7	21.7	20.9	21.4			21.2	21.1	20.4	20.0

Sources: U. S. Department of Commerce, Bureau of Census; Automobile Facts and Figures, Automobile Manufacturers Association; Future Highways and Urban Growth, Automobile Manufacturers Association; MUTS Estimates; Registrar of Motor Vehicles, State of Montana

population in 1985 will amount to 73,500 persons, an increase of about 58 percent. This rate of growth amounts to about 2.3 percent per year.

The CBD in 1965 provided employment for 5,185 workers. The largest employment categories were retail sales and services, employing a total of 2,672 persons. The estimated 1985 employment in the CBD is 8,100 persons, an increase of about 56 percent. The retail and services employment in 1985 is estimated to amount to 4,147 persons, an increase of about 55 percent.

In 1965, the total retail sales in the Study Area amounted to about $78.7 million. The CBD captured $34.1 million in retail sales, about 43 percent of the total. In 1985, the retail sales in the CBD are estimated to increase to $43.8 million, a growth of about 28 percent. Primary retail sales are estimated to increase from $18.6 million to $21.8 million, while the growth in secondary retail is estimated to increase from $9.2 million to $14.5 million, increases of 17 percent and 57 percent, respectively.

Vehicle Trips to the CBD

On a typical weekday in 1965, a total of 23,350 vehicle trips were made to the CBD. In addition, about 2,310 through trips made a stop in the CBD for purposes such as vehicle service, meals and lodging. Of the 23,350 vehicle trips, 4,190 were home based work trips, 7,220 were other home based trips, 7,980 were non-home based trips and 3,960 were commercial vehicle trips.

In 1985, the CBD is expected to attract 34,630 vehicle trips on an average weekday. The through trips making a stop in the CBD in 1985 will total 7,220. Concurrently, the home based work trips to the CBD in 1985 are estimated at 7,030 trips, the other home based trips at 9,030, the non-home based trips at 11,110 and the commercial vehicle trips at 7,460.

The total vehicle trips to the CBD in the twenty year period are estimated to increase by about 48 percent. The home based work trips are estimated to increase by 68 percent, the other home based trips by 25 percent, the non-home based trips by 39 percent and the commercial vehicle trips by 88 percent. The 1985 through trips making a stop in the CBD are estimated to increase by 212 percent.

A more detailed description of the vehicle trip forecast for the entire Study Area appears in the following sections in this chapter.

Land Development Trends

In 1965, the Missoula CBD contained a total of 308 acres of land. Fifty-six acres, about 17 percent, were in commercial use. Streets and alleys consumed about one-third of the land area and land in residential use amounted to 23 percent.

A more precise indicator of the CBD development is the use and the amount of floor area. In 1965, the CBD contained about 2.5 million square feet of nonresidential floor area. The forecast indicates that by 1985 the amount of nonresidential floor area will grow to 3.8 million square feet, an increase of about 52 percent. Table VI-5 shows the current and estimated floor area by use for the CBD. The predominant CBD core area uses, such as retail trade, services, finance, insurance, real estate, and government, are estimated to expand from 2.2 million to 3.4 million square feet, a growth of about 54 percent over the twenty year period.

Vehicular Access

Poor access to the CBD, internal circulation inefficiency, traffic congestion and lack of convenient parking have led to development of suburban shopping centers. If the CBD is to grow and prosper, the access, internal circulation and parking should be remedied.

It will be difficult to determine the amount of business that the remedies will produce. However, it can be concluded with certainty that if access to the central area and internal circulation are improved, the exodus to the suburban shopping centers will be minimal or nearly stopped. The plan for traffic access and circulation, discussed later in this report, has been designed to provide improved traffic access to the CBD. The plan also provides for improved traffic circulation in the central area itself.

If the plan recommendations in and around the CBD are implemented within a reasonable time, the shift of business activity to suburban locations can be stopped. Thus, parking demand in the CBD will not decrease but will rise with the growth of economic activity.

TABLE VI - 5

CBD FLOOR AREA

	1965[a]	1985[a]
Construction	46,000	70,000
Manufacturing	114,000	114,000
Trans., Comm., Util.	75,000	111,000
Government	209,000	359,000
Wholesale Trade	51,000	80,000
Retail Trade	742,000	951,000
Fin., Ins., Real Estate	97,000	157,000
Services and Misc.[b]	1,145,000	1,930,000
TOTAL	2,479,000	3,772,000

[a]Area expressed in square feet
[b]Includes agriculture

Source: Clark, Coleman & Rupeiks, Inc.

1985 Parking Demand

It is conservatively estimated that parking demand in the CBD will increase about 49 percent between 1965 and 1985. The 1965 parking demand of 21,664 space-hours between 10:00 a m. and 6:00 p.m. will increase by 10,530 space-hours to a total of 32,194 space-hours by 1985. The short-term parking demand is estimated to increase from 8,931 space-hours in 1965 to 11,432 space-hours in 1985. The long-term parking demand in turn is estimated to increase from 12,733 space-hours to 20,762 space-hours in 1985. As an urban area grows, workers constitute a rising proportion of the CBD's daytime population, resulting in a corresponding rise in the proportion of all-day or long-term parkers.

Growth in the CBD over the next twenty years will not be uniform. In some sub-areas, extensive development will take place; in other areas, little or no growth will occur. Table VI-6 shows the forecasted growth in short and long-term parking demand by analysis zones The boundaries of each analysis zone in the CBD are shown in Figure 11.

Expressing the forecasted 1985 space-hours of parking demand in number of parking spaces results in a demand for 2,595 long-term parking spaces and 1,681 short-term parking spaces. The 1985 total parking demand amounts to 4,276 parking spaces. The ability of the available 1985 parking supply to meet the forecasted demands will be analized in Chapter IX.

TABLE VI - 6

FORECASTED 1985 CBD PARKING DEMAND

Analysis Zone	LONG TERM Space-Hour Demand 1965	LONG TERM Space-Hour Demand 1985	SHORT TERM Space-Hour Demand 1965	SHORT TERM Space-Hour Demand 1985	TOTAL Space-Hour Demand 1965	TOTAL Space-Hour Demand 1985
01	585	966	484	666	1,069	1,632
02	1,624	2,163	557	667	2,181	2,830
03	863	1,117	969	1,147	1,832	2,264
04	894	959	486	558	1,380	1,517
05	1,125	1,421	659	818	1,784	2,239
06	781	1,035	1,056	1,164	1,837	2,199
07	769	907	678	806	1,447	1,713
08	685	1,420	343	378	1,028	1,798
09	444	1,048	533	603	977	1,651
10	616	1,086	78	84	694	1,170
11	1,604	3,345	703	796	2,307	4,141
12	287	444	489	568	776	1,012
13	1,114	1,148	847	947	1,961	2,095
14	649	1,130	645	881	1,294	2,011
16	677	2,557	376	1,321	1,053	3,878
17	16	16	28	28	44	44
TOTAL	12,733	20,762	8,931	11,432	21,664	32,194

Source: Clark, Coleman & Rupeiks, Inc.

TRAVEL FORECASTS

Forecasts of socio-economic activity and land use are prerequisites to travel forecasting. Trip making is a behavioral phenomenon, related to the socio-economic characteristics of people. Trip making can be determined as a function of such factors as household characteristics, employment and school enrollment. This approach relates the volume of trip making to human needs. Such socio-economic characteristics, however, must be ultimately related to variables that are determined from a land use plan.

The process of developing estimates of future travel involves first, a trip end forecast, the trip end linking by means of a mathematical model and the forecast of through trips.

Generally, in large metropolitan areas, a person trip forecast is made. This forecast is then split between various modes of travel such as automobiles and various modes of transit, such as buses and railroads. In Missoula in 1965, little transit travel took place and in late 1965, transit service was discontinued. While it is in the public interest to restore transit service, the proportion of total trips captured by the transit service will have little effect on physical design recommendations for the future streets and highways system. In light of this fact, there is little point in developing a person trip forecast for Missoula and then going through a modal split process to obtain transit and vehicle trips. For practical planning considerations, the travel forecast in Missoula will be made for vehicular travel only.

Trip End Forecast

The selection of a specific trip distribution model, the "gravity model," requires that the trip end forecast be prepared in specific format. The gravity model requires that trip ends be organized in terms of production and attraction. As mentioned in Chapter IV, a decision was made to develop the trip distribution model using four trip purposes. The purposes were home based work trips, all other home based trips, non-home based trips and commercial vehicle trips. A separate forecast was prepared for the production and attraction of each of the four purposes.

In an urban area the size of Missoula, a significant proportion of travel in the Study Area is done by persons living outside the cordon boundary. Little is known about the

socio-economic characteristics of these people. However, information about their trips inside the Study Area is quite complete. A different approach to forecasting the trip ends for internal and external area residents is thus necessary and has been carried out.

Internal Trip End Forecast

A regression approach forecasting future trip ends was attempted and abandoned after an examination of initial results. While the coefficients of correlation and the regression coefficients were highly significant statistically, they were also rather small. In addition, the standard error was, in relative terms, sizable. The obvious conclusion was that any forecasts using regression equations would yield meaningless results. These regressions were based on household averages. By using analysis zonal totals, it is possible to get high coefficients of correlation, but this technique is not statistically appropriate and the results are spurious.

As a consequence of the above results, a somewhat simpler approach was developed. The basic technique was to take all analysis zones from which a minimum of ten interview samples had been selected. For each of these analysis zones, calculations were carried out to determine simple statistics such as average household size, average number of autos per household, average number of trips per household and average number of trips per person. By arranging the analysis zones in order of ascending magnitude on each of these statistics, an attempt was made to group together analysis zones with similar characteristics. Each analysis zone with more than ten samples was eventually assigned to one or another of nine zonal groupings.

The results of the groupings were examined for consistency in terms of location and characteristics of development. Some changes resulted in the initial group assignments. The analysis zones with fewer than ten samples were assigned to various groupings by judgment. Geographically, these analysis zones constituted sparsely developed fringe areas. The trip generation rates for the nine groupings of analysis zones are shown in Table VI-7.

The pattern of internal trip generation rates developed by this technique is both plausible and consistent. In groups one through five, household size and trip generation rates increase at the same rate. In general, the rates for the home-based other trip purpose increase more rapidly than those for work and the rates for the non-home based trip

TABLE VI - 7

INTERNAL VEHICLE TRIP PRODUCTIONS - HOUSEHOLD GENERATION RATES

Group Number	Average Household Size	Home Based Work	Home Based Other	Non-Home Based	Total
1	1.27	0.67	1.00	0.63	2.30
2	2.46	0.86	1.95	1.24	4.05
3	2.96	1.02	3.16	2.01	6.19
4	3.04	1.58	3.70	2.35	7.63
5	3.60	1.68	3.85	2.45	7.98
6	3.18	1.70	2.91	1.85	6.46
7	3.63	2.10	3.55	2.25	7.90
8	3.93	2.36	4.25	2.69	9.30
9	4.15	2.53	3.72	2.36	8.61
AVERAGE	3.26	1.62	3.46	2.20	7.28

Source: Clark, Coleman & Rupeiks, Inc.

purposes increase fastest of the three. The household size for group six represents a drop with a corresponding drop in generation rates. Essentially, groups six and seven represent lower income areas, and groups eight and nine the extreme suburban analysis zones. Generation rates for group nine are below those of group eight even though the farmer has a larger average household size. In general, analysis zones in group nine are lower income than those in group eight, but are characterized by younger and larger families.

A simplified structure was also utilized to develop trip attraction generation rates. Basically, trips are made because some activity is to be performed. At the attraction end, there are normally people associated with these activities. These may be people employed or in residence. An analysis zone may have either kind or a combination of both activities. Trip attraction generation rates were developed in two steps. First, predominantly residential analysis zones with little or no employment were grouped. Preliminary attraction generation rates per resident were computed for each trip purpose including, this time, a purpose for commercial vehicle trips. Secondly, analysis zones with large employment and little or no residential population were grouped and preliminary attraction generation rates per employee were computed for each of the four trip purposes.

Following the above procedure, the preliminary generation rate for residents was applied to the population in each analysis zone. The preliminary generation rate per employee was applied in a similar manner. For each purpose, the sum of all attractions through application of both rates was compared to the actual total number of attractions for the trip purpose. The comparison provided ratios which were applied to the preliminary attraction trip generation rates. Application of these correction ratios created a set of rates which, when applied to the 1965 analysis zonal population and employment, gave the correct area-wide totals for vehicle trip attractions for each trip purpose. An exception to the procedure described above is home-based work trip attractions which were based on employment only. The trip attraction generation rates developed are shown in Table VI-8.

Non-home based trips are not always produced in the same analysis zone containing the residence of the trip maker. In the analysis, the application of the non-home based production generation rates were used to establish a Study Area total. The analysis zonal distribution of non-home

TABLE VI - 8

INTERNAL VEHICLE TRIP ATTRACTION - PER CAPITA GENERATION RATES

Generation Category	Home Based Work	Home Based Other	Non-Home Based	Commercial Vehicle
Rates per employee	1.64	1.75	1.15	0.80
Rates per resident	--	0.50	0.30	0.25

Source: Clark, Coleman & Rupeiks, Inc.

based production and attraction was determined through the application of trip attraction generation rates. In each analysis zone, the production was set equal to the attraction and the whole was balanced to the control total. For commercial vehicle trips, the production in each analysis zone was also set equal to the attraction.

Analysis Zone 58, containing the University of Montana campus, was held out of the general analysis. Separate forecasts, based on projected enrollment, employment and other consideration, were prepared for trip production and attraction for all four trip purposes.

The forecast of 1985 trip ends involved utilization of the land use forecast of households and employment by analysis zone. The expected development in each analysis zone was evaluated and each zone was placed in one of the nine trip production generation categories. For each analysis zone, the number of trip productions and attractions were computed for each of the four trip purposes through application of the established trip production and attraction generation rates.

External-Internal Trip End Forecast. The 1965 cordon line crossing volume of 22,490 vehicles was estimated at 72,100 vehicles by 1985, an increase of about 220 percent, or 6.0

percent annually. This estimate was based on historical traffic volume data, growth in vehicle registration, growth of population in the State, the County and the Study Area, and on the increase in long distance trip making expected with the improved Interstate Highway System.

The 1985 through trips were estimated at 12,500, resulting in 25,000 vehicle crossings of the cordon line. The increase in through trips over the twenty year period amounted to about 192 percent, or about five and one half percent per year. The proportion of through trips at the cordon line is expected to decrease from 38 percent in 1965 to 35 percent by 1985.

The 1985 estimate of 47,100 external-internal vehicle trips was converted into a forecast of production and attraction for each of the trip purposes. The basic trip purpose production and attraction structure found in 1965 was applied and adjusted to changes occurring in the internal trip end forecast. Finally, trip production and attraction for the four trip purposes were developed for each of the four external cordon line stations.

Summary of Trip End Forecast. The forecasted 1985 trip ends produced and attracted in the 117 analysis zones, and by the four external cordon line stations, for each of the four trip purposes are shown in Table VI-9. The total trips produced or attracted in the Study Area is estimated to grow from 127,312 in 1965 to 238,226 in 1985, an increase of about 87 percent. Home-based work trips are estimated to grow from 23,921 to 45,335, an increase of about 90 percent. Other home-based trips are estimated to grow about 85 percent from 51,578 to 95,399. The non-home based trips are estimated to grow about 89 percent and the commercial vehicle trips by 87 percent. Within the internal area in 1985, about 17 percent of all travel will take place by commercial vehicles and 83 percent by passenger vehicles.

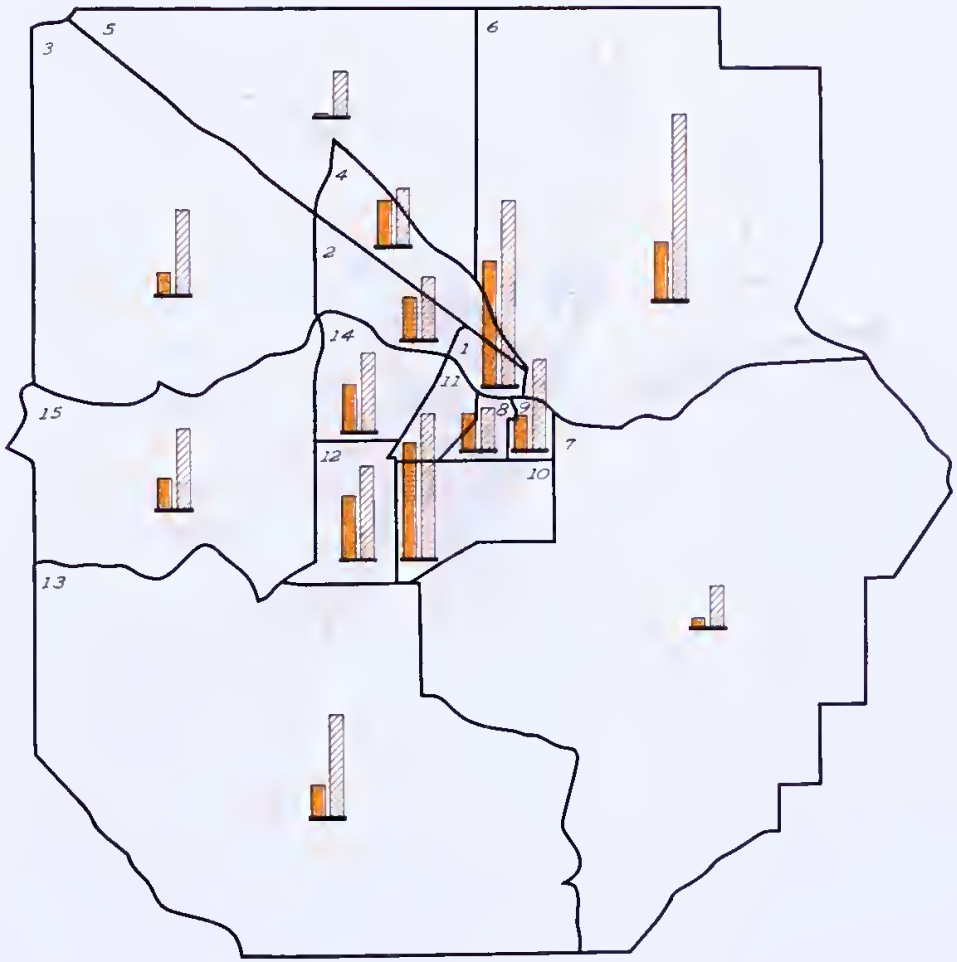
Figure 25 shows the 1965 and the 1985 forecasted trip ends in each of the fifteen districts. In addition to the forecasted through trips in 1985, approximately 34,600 trips will be performed by drivers entering, leaving, or moving entirely within the CBD. These trips will represent 14 percent of the total 1985 forecasted vehicle trips, while the remaining 86 percent will have neither end of the trip within the CBD. Only three percent of the total trip ends to the CBD are made within the district indicating that the majority are made to areas outside.

TABLE VI - 9

COMPARISON OF 1965 AND FORECASTED 1985 VEHICLE TRIPS

	1965 Trips	1985 Trips	Percent Increase
Home Based Work	23,921	45,335	89.5
Other Home Based	51,578	95,399	85.0
Non-Home Based	29,866	56,466	89.1
Commercial Vehicle	21,947	41,026	86.9
TOTAL	127,312	238,226	87.1

Source: Clark, Coleman & Rupeiks, Inc.



TRIP ENDS 1965-1985

8 ANALYSIS DISTRICT NUMBER

FIGURE 25

Clark, Coleman & Rupeiks, Inc
Helena - Seattle

The district containing the University of Montana is also a high vehicle trip end generator. The vehicle trips to, from and within in 1965 amounted to 10,251. The 1985 forecast indicates 33,451 trip ends, an increase of 225 percent. These trips will represent about seven percent of the total 1985 forecasted vehicle trips. The greatest growth in forecasted vehicle trips is found in outlying areas where new development most likely takes place.

The relationship between travel and socio-economic characteristics for 1965 and for 1985 are shown in Table VI-10. The table indicates a 19 percent increase in trips per person resulting from a decrease in average household size and increased vehicle ownership. As a result, trips per household and trips per vehicle also show an increase.

Trip Distribution

The linking of vehicle trip production and attraction to provide the distribution of 1985 vehicular travel was accomplished by the application of a trip distribution model. Forecasted trip production and attraction for all Study Area analysis zones and the external cordon line stations were linked by means of the model. Through trips were tested separately and will be discussed later in this chapter.

The result of the trip end linking process is an internal, internal-external zone to zone trip volume table. The forecasted 1985 vehicular trip volumes between sub areas can be depicted, observed, analyzed and utilized in testing the workability of alternative future street and highway improvements.

Trip Distribution Model. The trip distribution model used in Missoula was the "gravity model." As the name implies, this model adapts the gravitational concept, as advanced by Newton in 1686, to the problem of distributing traffic through an urban area.

In essence, the gravity model states that trip interchange between analysis zones is directly proportional to the relative attraction of each of the analysis zones and inversely proportional to some function of the spatial separation between zones. This function of spatial separation adjusts the relative attraction of each analysis zone for the ability, desire, or necessity of the trip maker to overcome the spatial separation involved. A model strictly analagous to the inverse square relationship of gravitational attraction has been modified to accommodate the variation in generation intensity. The generally accepted form of the gravitational model can be expressed mathmatically as follows:

TABLE VI - 10

COMPARISON OF TRIP GENERATING CHARACTERISTICS

Item	1965	1985	Ratio 1985/1965
Population	46,430	73,500	1.59
Households	14,610	23,355	1.60
Vehicles owned	25,767	46,000	1.78
Vehicle trips made[a]	119,924	225,269	1.88
Persons per household	3.18	3.15	0.99
Persons per vehicle[b]	1.80	1.60	0.89
Vehicles per household	1.76	1.97	1.12
Trips per person	2.58	3.06	1.19
Trips per household	8.21	9.64	1.17
Trips per vehicle	4.65	4.90	1.05

[a]Trips by Study Area residents only

[b]Represent vehicle ownership comparison, not vehicle occupancy

Source: Clark, Coleman & Rupeiks, Inc.

$$T_{ij} = P_i \frac{\dfrac{A_j}{d_{ij}^{\,b}}}{\dfrac{A_1}{d_{i1}^{\,b}} + \dfrac{A_2}{d_{i2}^{\,b}} + \ldots + \dfrac{A_n}{d_{in}^{\,b}}}$$

Where T_{ij} = trips produced in analysis zone i and attracted to analysis zone j.

P_i = trips produced by analysis zone i.

A_j = trips attracted by analysis zone j.

d_{ij} = spatial separation between analysis zones i and j.

b = an empirically determined variable exponential function which expresses the effect of spatial separation between analysis zones on trip interchange.

In the application of the model, the use of a set of travel time factors to express the effect of spatial separation on analysis zonal trip interchange, rather than the traditional inverse exponential function of time, simplifies the computational requirements of the model.

Model Calibration. A trip distribution model is calibrated when it synthesizes with high degree of accuracy the observed travel patterns in an urban area. The calibration process involves determination of model parameters. In the gravity model process, the parameters are analysis zonal trip production and attraction, spatial separation between analysis zones and the impediments to interzonal travel. Trips produced and attracted for various purposes in each analysis zone and at the external cordon line station have been determined for 1965 and forecasted for 1985.

The measure of spatial separation between analysis zones is the travel time along the minimum travel path. The search for the shortest time path through a system of streets and highways is complex and time consuming, but the time element has been overcome by computerizing the procedures. In addition, terminal times at both ends of the trip must be added to interzonal travel time in order to allow for differences in parking and walking times. Intrazonal driving times, or the average driving times of those trips starting and ending within the same analysis zone, have been estimated.

The impediment to interzonal travel created by spatial separation has been expressed in travel time factors. These factors have been computed for each one-minute increment of travel time for each of the four trip purposes.

Having determined the parameters, the inputs to the gravity model, the travel patterns in the area are then synthesized. These travel patterns are compared with the observed patterns and differences are noted. Corresponding changes are then made in the travel time factors and the area's travel patterns are synthesized again. These steps are repeated until a set of travel time factors are developed that, when applied to the gravity model formula, will synthesize with a high degree of accuracy the observed travel patterns in the urban area This process of successive iterations is termed model calibration. In Missoula, model calibration required four such iterations before it synthesized with a high degree of accuracy the observed 1965 travel patterns.

Various statistical tests were performed to test the reliability of the trip distribution model in synthesizing the observed 1965 travel patterns.

One of the evaluations of the model accuracy is the trip length frequency comparison. After four iterations of the model, the comparison between the base trip length distribution and the gravity model trip length distributions indicated that any further adjustment in the friction factors would result in negligible improvement. The base period, 1965 travel survey and trip length frequency distributions, along with the results of the first and fourth iterations of model calibration, are shown in Figure 26. Table VI-11 summarizes the numerical results of the model calibration in total vehicle hours of travel for each of the four trip purposes.

Examination of the trip length frequency distribution reveals that the comparisons are excellent. The synthesized vehicle hours of travel show remarkably close agreement with the 1965 data, differing in total only three-tenths of one percent. The results indicate that the trip distribution model accurately synthesizes the number of vehicle trips in each trip purpose and length category.

One of the statistical evaluations involves assignment of both the accumulated 1965 travel data and the model synthesized travel data to a theoretical route network connecting all adjacent analysis zone centroids by straight lines, thus resembling a spider's web. Observed and synthesized trip interchanges between analysis zones on the spider web network were routed through centroids by the minimum travel distance path and the total accumulation of trips indicated for each link in the network.

TABLE VI - 11

COMPARISON OF TOTAL VEHICLE HOURS OF TRAVEL

Trip Purpose	1965 Travel Data	Model Synthesized	Numerical Difference	Percent Difference
Home based work	4,376	4,378	+ 2	+0.05
Home based other	8,142	8,166	+24	+0.29
Non-home based	4,347	4,373	+26	+0.60
Commercial vehicles	3,052	3,060	+ 8	+0.26
TOTAL	19,917	19,977	+60	+0.30

Source: Clark, Coleman & Rupeiks, Inc.

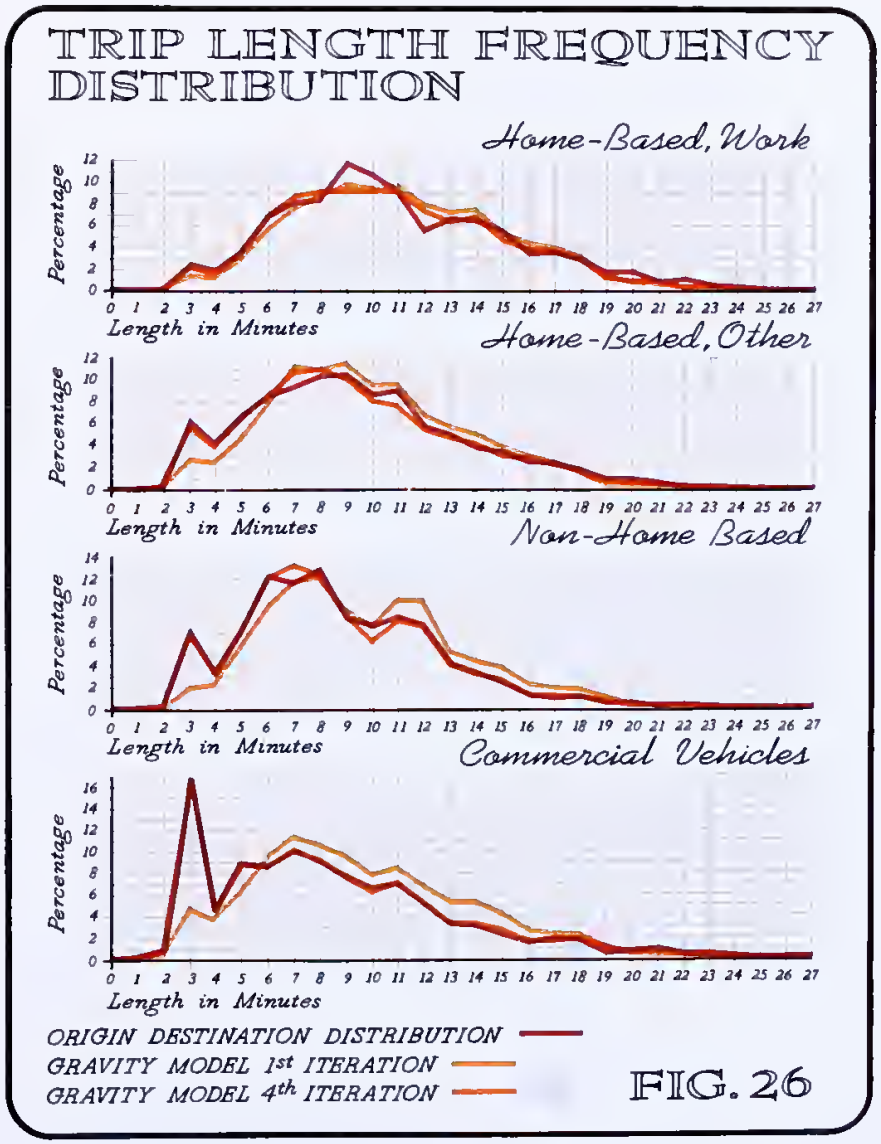


FIG. 26

The results of the spider web traffic assignment were checked at two screenlines, the Clark Fork River and an arbitrary north-south line cutting the Study Area into two parts. From the 1965 travel data, a total of 45,989 trips were assigned to links crossing the river screenline. The gravity model synthesized link volumes amounting to 44,894, resulting in 1,095 trips or 2.4 percent less than the 1965 travel data. On the north-south screenline the 1965 travel data produced 50,952 trips while the synthesized trips amounted to 51,948, or 996, 2.0 percent, above the survey data. These were considered excellent comparisons and tended to indicate that the synthesized trip distribution by major geographic area replicates the observed 1965 area-wide travel.

Another statistical check, based on the results of the spider web traffic assignment, was to compare the two sets of assigned link volumes by grouping links together according to the volume carried. In this case, the 1965 survey data was used as the basis for grouping. Table VI-12 shows the comparison of trip volume groupings between the accumulated and synthesized travel data.

With few exceptions, as the traffic volumes carried on the links increased, the average percent error declined. The

TABLE VI - 12

COMPARISON OF TRIP VOLUME GROUPINGS

Volume Groups	Number of Links	1965 Travel Survey Volumes	Average Percent Error for Group
0 - 99	14	654	29.20
100 - 499	27	7,302	38.25
500 - 999	15	10,666	20.57
1,000 - 1,999	27	37,115	15.27
2,000 - 2,999	19	47,055	8.01
3,000 - 3,999	19	63,019	8.02
4,000 - 4,999	15	67,863	6.22
5,000 - 6,999	27	163,968	6.73
7,000 - 9,999	18	143,920	6.52
10,000 and over	10	113,484	4.42
TOTAL	191	655,046	7.53

Source: Clark, Coleman & Rupeiks, Inc.

average error, considering all links, was 7.53 percent. Although some volume groups showed a sizable average error, their effects were relatively unimportant as a whole. The first four volume groups with an average error greater than 15 percent included a total of 55,737 trips or 8.5 percent of the total volume carried on all links. The average error for the four groups was 19.5 percent. Weighing the 19.5 percent error by the 8.5 percent which this group was of the total volume, results in an error of 1.66 percent.

Comparison of the synthesized and the 1965 observed traffic volumes on a link-by-link basis and in meaningful groupings indicates close agreement. The conclusion was that the gravity model synthesized vehicle trips quite adequately on a small area link-by-link basis.

Intrazonal trips from the 1965 travel data were compared with the synthesized intrazonal trips. The model synthesized 8,430 intrazonal trips compared to the observed 9,822 intrazonal trips resulting in a deficiency of 1,392 trips or 14.2 percent. The deficiency of intrazonal trips varied from 6.9 percent for non-home based trips to 22.3 percent for the commercial vehicle trips. The results could have been better but were accepted because of the small size of the analysis zones and the minor influence of intrazonal trips on planned streets and highways systems.

Often, specific zone to zone adjustment factors have been incorporated into the gravity model formula to allow for the incorporation of the effect on travel patterns of defined social or economic linkages not otherwise accounted for in the gravity model parameters. In Missoula the decision to exclude any specific adjustment factor was based on the generally excellent results from the model.

Results of the various statistical accuracy tests indicated that the trip distribution model was properly calibrated and produced reliable travel data. Research has indicated that a calibrated trip distribution model accurately synthesizing current travel will synthesize future travel given future trip end forecasts and travel time. Travel time factors, are assumed to remain constant in the future. Having forecasted 1985 trip end data, travel times and calibrated travel time factors, the forecasted 1985 trips were distributed throughout the Study Area by means of the gravity model.

Through Trips

The 12,500 trips forecasted to pass through the Study Area

in 1985 were distributed between the external cordon line stations by means of the "Fratar" trip distribution model. The Fratar model develops future trip interchanges by expanding the pattern existing in the base year. Table VI-13 shows the 1965 and forecasted 1985 through trips between the external cordon line stations. Figure 27 shows the forecasted 1985 through trips in a schematic manner.

1985 Travel Patterns

The forecasted and distributed internal, external-internal and through trips are combined by analysis zone into an analysis zone trip table. The zone to zone traffic volumes will be utilized in transportation plan preparation and testing. Alternative street and highway improvements will be evaluated in terms of community values and ability to carry forecasted traffic volumes. Plan testing will involve assignment of zone to zone traffic volumes to alternative streets and highways networks. Transportation plan development, testing and evaluation will be described in the following chapters.

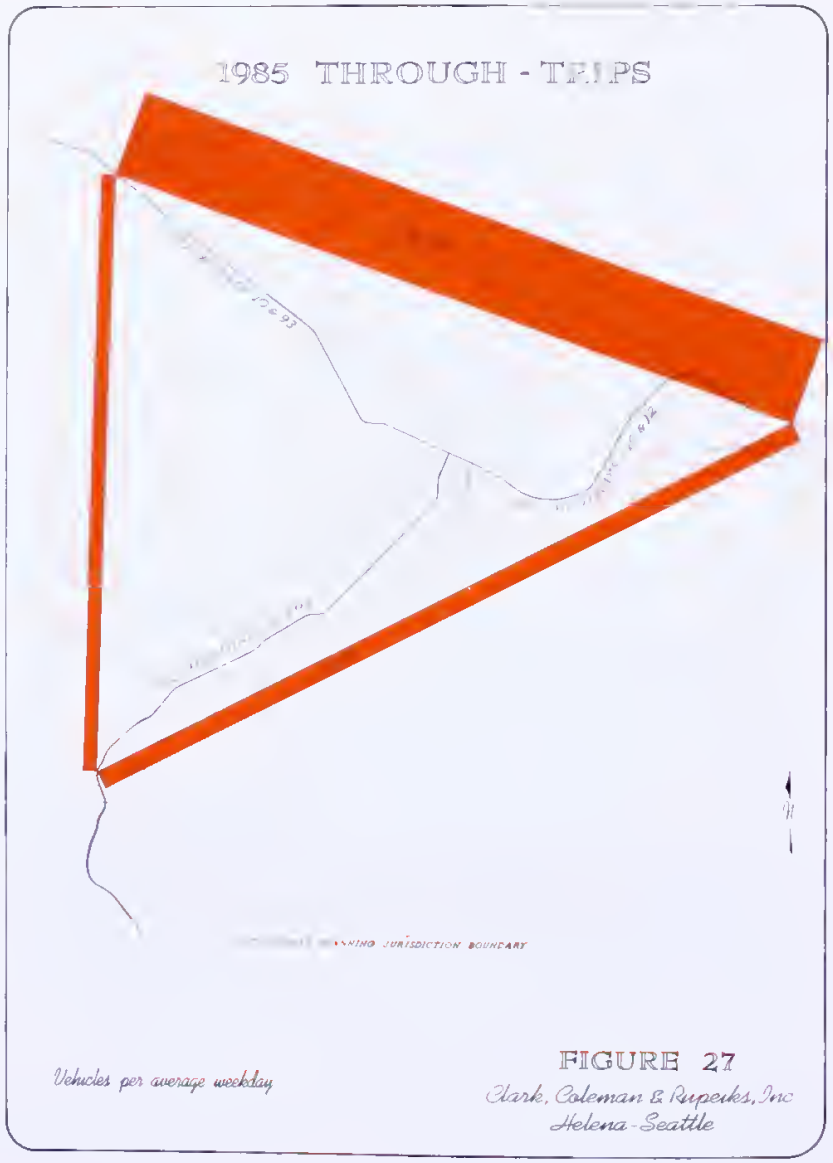


FIGURE 27
Clark, Coleman & Rupeiks, Inc
Helena-Seattle

TABLE VI - 13

THROUGH TRIPS AT CORDON LINE

	U. S. 10 W.	U. S. 10 E.	U. S. 93 S.	Mullan Road	Total
U. S. 10 West					
1965	-	2,884	647	3	3,534
1985	-	9,022	1,470	8	10,500
U. S. 10 East					
1965	2,884	-	724	6	3,614
1985	9,022	-	1,962	16	11,000
U. S. 93 South					
1965	647	724	-	11	1,382
1985	1,470	1,962	-	12	3,454
Mullan Road					
1965	3	6	11	-	20
1985	8	16	22	-	46
TOTAL[a]					
1965	3,534	3,614	1,382	20	8,550
1985	10,500	11,000	3,454	46	25,000

[a]One through trip is counted twice at the cordon line. Total through trips were 4,275 in 1965 and are forecasted to be 12,500 in 1985.

Source: Clark, Coleman & Rupeiks, Inc.

CHAPTER 7

CHAPTER VII TRANSPORTATION PLAN DEVELOPMENT

This chapter is designed to give direction to the process of plan development and to establish a basis for plan selection. Specifically, this chapter defines goals and objectives, gives recognition to planning restraints and describes the concepts and elements by which progress toward these goals will be made. Future travel needs are analyzed, the planned and programmed transportation improvements evaluated in their adequacy to serve the future travel needs, and the principal deficiencies identified.

The basic premise in transportation plan development is that the demonstrated choices of people, individually and collectively, reflect their preferences and values, and that a plan must embody these values in its design. Transportation facilities should be planned in response to how people wish to travel, where and when they wish to go, and with complete acceptance of their reasons for making trips. This premise is consistent with the policy statement of the American Society of Civil Engineers:

"Freedom to select the vehicle or system the individual prefers, for any reason, is the inherent right of the individual and should be a consideration in all transportation planning. Group behavior and group needs should be criteria for provision of transportation facilities."

GOALS AND OBJECTIVES

The urban transportation planning objectives have been formulated and adopted by the community and fit within the framework of goals adopted for comprehensive planning, of which transportation planning is a major component. The goals are directed toward providing the most desirable place for people to live, work and pursue happiness with maximum service, amenity, economic opportunity, and safety at reasonable cost.

Transportation planning, however, requires clearly defined and measurable objectives that will contribute directly toward the achievement of the basic goals. The transportation planning objectives formulated and adopted for Missoula can be summarized as follows:

- Reduction of travel time
- Increased safety

- Lower operating costs
- Economy in new construction
- Minimizing disruption
- Promoting better land development

Reduction of Travel Time. That people want faster transportation is not open to question. People realize that time is consumed in traveling from place to place; they would prefer, however, the shortest time possible.

Increased Safety. Traffic accidents are a costly adjunct of travel, not only in a monetary sense, but also in the pain of personal injury and death.

Lower Operating Costs. Operating costs include those expenses which reflect the output of work required to move a person over the distance of his journey. These are the costs of gasoline, oil and wear on tires and other parts of the vehicle.

Economy in New Construction. Street facilities are among the most expensive public works that can be built. Since the construction and financial resources of the region are limited, area residents will certainly wish to economize on capital outlays for new street facilities. However, a policy of no new construction would obviously be a false economy since, in lieu of payment for new facilities, people would pay in delay, congestion and inconvenience. Some new street facilities are necessary and, while the investment is great, the return from increased productivity will be even greater.

Minimizing Disruption. The construction of any major transportation facility will bring disruption to homes and businesses and probably to utilities, communications and other urban activities. These disruptions are expensive, irritating and time consuming. Nevertheless, all changes bring disruption and change is necessary if urban areas are to improve. Since such changes are expensive, dislocation should be avoided if possible; however, this objective is not so great as to cause all construction to cease.

Promoting Better Land Development. New facilities can be used not only to make travel easier, but also to increase land values and improve the arrangement of land uses. Preservation of neighborhoods and stablization of land uses are among the benefits to be realized.

PLANNING RESTRAINTS

Statements of goals and objectives give direction to plan development and represent an important commitment to working processes. It is apparent, however, that plan development will be influenced in varying degrees by many other factors. These considerations have been grouped under the inclusive title of restraints. Together with objectives, they further limit the avenues of approach in analyzing the long-range transportation problems of the Missoula area.

A transportation plan is designed as a guide to be followed by those responsible for providing adequate transportation facilities. Its true value will be realized if it directs action and decisions toward common goals mutually supported by those in responsible position. The transportation plan will not be a cure for all of Missoula's urban travel problems. The solutions to everyday problems such as timing of traffic signals, locations for loading zones, and turn restrictions will be left up to detailed study and analysis by engineers responsible for operations.

Advancement of desirable standards for geometric street design and recommended corridor alignments for new arterial or collector streets are proper functions of the plan. Although the final geometric design of specific major streets is not within the scope of this plan, sketches illustrating the application of the recommended street design standards will be presented.

The primary task of the Transportation Plan is to provide a measure of future intra-urban travel demand and to recommend a system of transportation facilities in response to this demand. In a system approach it is no longer possible to consider one facility at a time, for one affects the other. Although improvements to the system will be a piecemeal basis, it must be planned as though it were to be constructed overnight. The solution to urban travel needs is an integrated system of facilities.

One of the positive restraints to planning is the transportation facilities and land development already in existence. These conditions have evolved over the years in response to complex economic and social factors, and rapid or indiscriminate change is neither justified nor desirable. The transportation planning process should strive to conserve capital invested in existing urban development and transportation systems by utilizing and, where practical, expanding existing transportation facilities.

Another area of restraint ties in the plans which have been devised in the past and which represent extensive study and coordination between public and private interests. New transportation proposals should be carefully formulated on the basis of current data and critically compared with existing plans so that the plan avails itself of prior thinking and so that variances are conceived in full knowledge of previous planning.

The transportation plan in Missoula is directed toward the travel needs of a forecasted 1985 population of 73,500 persons. If the population of the Missoula area should reach this point a few years before or after the target year, it will make relatively little difference. New facilities, once planned, must be programmed at a pace consistent with the rate of growth and also with available fiscal resources.

The time span for which transportation plans are prepared places specific limits on what can be accomplished. A target year permits officials to prepare long-range improvement programs based on specific needs and time intervals in which financing arrangements can be planned.

The length of the planning period is important. Selecting a time too far into the future increases the probability of error in forecasting. It also increases the likelihood of unforeseeable technological advances becoming increasingly important in transportation of people and goods. A significantly shorter period, on the other hand, does not allow sufficient time to materially change or improve the present system. The target year of 1985 was considered to be a reasonable compromise between these extremes. Even though the target year of 1985 has been selected, the plan should not be viewed as an ultimate beyond which no improvements are made.

In practically any urban area, the cost of providing needed improvements in transportation greatly exceeds the public funds available. Substantial progress has been made in securing larger amounts of public funds for transportation improvement. However, the problems and the need for funds seem always to grow faster than progress is made in securing the additional monies. The transportation plan has been prepared in light of what is considered economically feasible and in the community's ability to pay.

PLAN CONCEPTS AND ELEMENTS

The foregoing discussion established the objectives of plan development and the restraints that influence and limit plan decisions toward achieving stated goals. In the following section, plan concepts and elements will be presented. Of specific concern are transportation facilities types, their land use and traffic service functions, the manner in which they are integrated into a system, and the ways in which they interact with land development.

Transportation Facilities

The analysis of the 1965 travel survey data clearly demonstrates both preference and need for travel by private automobile. As a result, the forecasts for future travel have been based on the premise that the private automobile will continue to be the primary mode of travel. The type of facilities required to meet 1985 conditions were therefore confined to streets over which passenger vehicles, trucks and some buses will move.

Under the increased traffic pressures of the future, it will no longer be possible to use streets as all-purpose roads. Of necessity, they must be specialized with each doing a particular part of a larger job. The increased interdependence of the specialized parts requires careful integration into an efficient transportation network.

Street facilities have the two principal functions of providing access to land and providing channels for the movement of vehicles or persons. For example, a dirt road leading to a lake is built primarily for access, while a freeway is built for the purpose of serving large volumes of vehicles at high speeds. The extent of the utilization of the four basic types of streets in the plan depends entirely on the degree of land access or traffic service that is provided.

Local Access Streets. The local street is one with a clear-cut function. Most of these are residential neighborhood streets whose primary function is land service. They must, of course, carry the volume of traffic generated by the adjacent land uses but such volumes are naturally very low. In residential areas averaging four households per acre, these streets will typically carry less than 500 vehicles per day. Local access streets in commercial or industrial areas have a similar function.

Because local streets are laid out to serve land, and because the main cost of construction rests on the land owner, these streets are narrow with alignments subordinated to the need of providing good building sites.

Collector Streets. The collector street is basically a local street where traffic service is given slightly greater emphasis. As its name implies, this type collects traffic from residential streets and carries it to arterials. The collector is designed to carry two or three times the traffic volume of local streets.

The design of a collector street in terms of pavement width and right-of-way differs very little from the local access street. In the operation, there is a distinct difference. Collector streets should be center striped and stop-lined at cross streets.

Arterial Streets. Arterials provide primarily a traffic service function and are given preference in the signing and signalization of intersections. Not only are they capable of handling more vehicles than local streets, but they are faster and safer as well.

Traffic service is an important function of arterials; however, they must also provide access to important abutting land uses, such as business, industry or major public use. This two-fold purpose is a necessity because high trip-generating land uses require the amount of access which an arterial can provide. Local streets have limited carrying abilities and freeways cannot connect directly with land uses. Therefore, arterials are the principal streets for these activities even though some conflict does occur between the two functions.

Arterial streets should be constructed, where possible, with centered medians. Medians allow left turning vehicles to be physically separated from through movements, provide refuge islands for pedestrians and effectively separate opposing traffic flows. Median openings should not be permitted more frequently than one at every cross street.

Parking normally should not be permitted on arterial streets. Limited right-of-way and high land values require that street space be devoted entirely to the task of moving vehicles rather than sharing them. Not only do parked vehicles use expensive street space, but they also interfere with efficient movement of vehicles in adjacent traffic lanes.

In densely built up areas, including the CBD, design of arterial streets must sometimes be compromised for economic reasons. In these areas, traffic control techniques are important. One-way streets, progressive traffic signal systems, turn lanes and turning restrictions are devices which can often provide adequate capacity without great cost. In suburban areas, where availability of right-of-way is not a critical problem, adherence to design standards should be maintained. In Missoula, arterials have been classified either as primary or secondary, depending upon the degree of traffic and land service provided.

Freeways. Freeways are at the opposite end of the street-type spectrum. Their function is to accommodate extremely high volumes of traffic at high travel speeds. In Missoula, Interstate Highway 90 is the only existing freeway and the need for other facilities of this type is not foreseen in the plan period. The primary function of the freeway in Missoula is to serve long distance inter-city traffic. It connects urban areas such as Spokane, Helena and Butte. The freeway in Missoula also serves long distance intra-urban traffic.

Freeways are designed for full control of access with grade separated interchanges not less than one mile apart. Opposing travel lanes are median divided. It is very important that the interchange points tie in and integrate with the local arterial street system. The investment in the freeway is monumental and great economic loss will incur if traffic has difficulty in getting on or off the system.

System Planning Guides

Street planning should go hand in hand with land use planning, inasmuch as the success of one depends upon coordination with the other. Land use generates traffic, and its type and pattern will determine the class of street needed. At the same time, streets can divide or unify related activities and subsequently destroy or create land values. Arterial street networks are among the more important land use determinants. The street system should be designed to preserve communities and neighborhood units as well as business and industrial districts.

Residential neighborhoods should be identified and studied in terms of their social character and traffic generating activities. Such considerations will lead to preferred spacing and location of collector and arterial streets.

Arterials should define rather than bisect neighborhoods. Collector streets must be sufficient to allow convenient and economical internal distribution, but at the same time, should not interfere with the basic social interaction of the neighborhoods.

The arterials should be planned so that they will unify the entire urban area. Their quality as servers of both traffic and land must be remembered. Arterials must provide not only efficient transportation between origins and destinations, but also access to major traffic generators such as business, industry, public buildings and transportation terminals. The proper interchange of traffic with rail and air terminals will be of major significance in saving time and cutting transportation costs.

The spacing of arterials should be intimately related to the size of land use units, trip densities and street capacity. As a general rule, arterials should not be spaced closer than one-half mile in high density areas. One mile spacing of arterials in outlying or suburban areas seems to provide adequate service.

EVALUATION OF FUTURE TRAVEL

Future travel in the Missoula area will increase at a higher rate than population and will reach unprecendent levels in the next twenty years. Travel will become longer and more concentrated. The broad scope of travel can best be illustrated by the projected 1985 daily travel for the urban area of Missoula, which is about twice that experienced in 1965.

Analysis of Future Travel

The evaluation of future travel service requirements necessitates relating the projected magnitude and distribution of future travel to the network of travel facilities. This procedure affords a comparative measure of traffic usage as related to traffic capacity on each facility.

The traffic volumes anticipated on each segment of the transportation network are estimated by assigning the projected zone-to-zone travel desires onto the street and highway network according to the most desirable routing which drivers are expected to use. The routings of each combination of zone-to-zone, zone-to-external station

and external station to external station movements are accumulated on each link of the network to reflect the total daily travel. The number of movements between each of the 117 internal zones and the four external stations requires the use of high-speed electronic computers.

Travel times were computed for each link of the network based on average speeds determined during the field studies. The total travel time accumulated between one analysis zone centroid and another was determined by the minimum time travel path. This path is determined by testing every possible combination of links through computer techniques. The volume of travel desires between analysis zones was then assigned along these minimum travel time paths.

Utilizing the above procedure, the 1965 travel data was assigned to the existing street network. The assigned volumes were compared against the ground counts to determine the accuracy of the traffic assignment procedure, the reliability of the travel speed data and the adequacy of the network. A good comparison between traffic assignment and ground counts indicates that the basic network was sufficiently extensive to represent all major routes in the Study Area.

Following the testing of the 1965 traffic assignments, the existing streets and highways network was updated to include improvements planned and programmed for construction. Travel speeds on updated sections of the network were determined, based on the expected design and operating conditions. Travel speeds on selected current links in the network were adjusted to represent travel conditions upon diversion of traffic to planned and programmed facilities such as Interstate Highway 90.

Planned and Programmed Improvement

All street or highway improvements, planned, programmed or under construction, were evaluated to determine the effect of the improvements on the street network system. All major street and highway improvements in new locations were added to the existing network. Improvements on the current system were noted and adjustments were made in travel speeds to correspond to the extent of the improvement. The study network, composed of major existing facilities, facilities planned and/or programmed for improvements and major facilities under construction, was assembled and termed the "Committed System."

The most dramatic improvement in the street and highway system was the construction of Interstate Highway 90 crossing the Study Area in an east-west direction. Interchange points in the Study Area were provided at intersections with the Grant Creek Road, Orange Street, Van Buren Street, and East Broadway in East Missoula. Two additional interchange points, a short distance outside the Study Area, were at the intersection with U. S. Highway 10-A and 93, west of the Study Area and at intersection with State Highway 20 to Bonner at Milltown, east of the Study Area.

The construction of Reserve Street between Interstate Highway 90 at Grant Creek interchange and U. S. Highway 12 and 93 north of the Bitterroot River, adjacent to the Fort Missoula grounds, has been scheduled for stage construction. Proceeding south from the Grant Creek interchange, the route would pass over the Northern Pacific Railroad tracks, form a grade separated interchange with U. S. Highway 10, intersect Mullan Road at grade and cross the Clark Fork River in the vicinity of Davis Street. Following along the Davis Street right-of-way, the route shifts westerly to the Reserve Street right-of-way and proceeds south connecting to the new alignment of U. S. Highway 12 and 93.

U. S. Highway 10 and 93 has been programmed for improvement to four travel lanes with median and parking lanes or shoulders between Lincoln Street and the interchange with Reserve Street. Improvements to U. S. Highway 10 and 12, east of Madison Street, have been programmed, including widening of the pavement and inclusion of a median with left turn storage bays.

The provision of additional side trackage by the Northern Pacific Railroad Company on its property requires the removal of the pedestrian overcrossing structure in the vicinity of Scott Street. The planned railroad improvements also require closure of the present crossing of the tracks in the vicinity of Van Evan industries. Serious plans have been advanced to construct a vehicle crossing of the railroad tracks in the vicinity of Scott Street in place of the pedestrian crossing and the Van Evan crossing.

Definite plans have been made and a considerable amount of monies budgeted to improve U. S. Highway 12 and 93, between Higgins Avenue and the crossing of the Bitterroot River. This section is programmed for construction to four travel lanes, with a median and parking lanes or shoulders where right-of-way permits. The decision of specific

improvements on Brooks Street between Higgins and South Avenues has been postponed pending receipt of the recommendations of the transportation plan.

Widening of the section of U. S. Highway 12 and 93 south between Lolo and the crossing of the Bitterroot River to four travel lanes is in progress.

The structure over Rattlesnake Creek at Lolo Street has been replaced with a wider superior structure permitting travel between Duncan Drive and Brayton Street.

Other improvements to the street and highway system in the Missoula area have been planned. These improvements consist of directional signing, signalization, street lighting and surfacing.

Future Traffic

Forecasted 1985 analysis zone to analysis zone vehicle travel movements, in an origin-destination matrix format, were assigned to the network of streets consisting of present and planned-programmed facilities using the minimum time path method. Results of this traffic assignment reflect two-way average weekday traffic usage on all principal links of the network, as shown in Figure 28. This assignment reflects the volume of traffic on the street and highway system in 1985 if no additional improvements are made beyond those presently programmed.

As expected, heavy traffic volumes are found on Interstate Highway 90, ranging from a low of 15,900 vehicles per average weekday west of Grant Creek interchange, to a high of 34,400 vehicles per day east of VanBuren interchange. The forecasted 7,200 through trips making a stop in the CBD result in a drop of traffic volumes to 17,600 vehicles per day between the Orange and VanBuren Street interchanges.

Heavy traffic volumes remain on U. S. Highway 10. West of the Reserve Street interchange, the volumes range from a low of 9,400 vehicles at the external cordon boundary to 14,100 west of the interchange. Volumes of 18,000 vehicles per day are indicated between Mullan Road and Russell Street. Through the CBD, volumes of 15,300 vehicles are indicated between Orange Street and Higgins Avenue. Between Higgins Avenue and Madison Street traffic volumes range from 15,100 to 20,500 vehicles per day. Volumes increase to 34,900 between Madison and VanBuren Streets. From VanBuren Street, traffic volumes

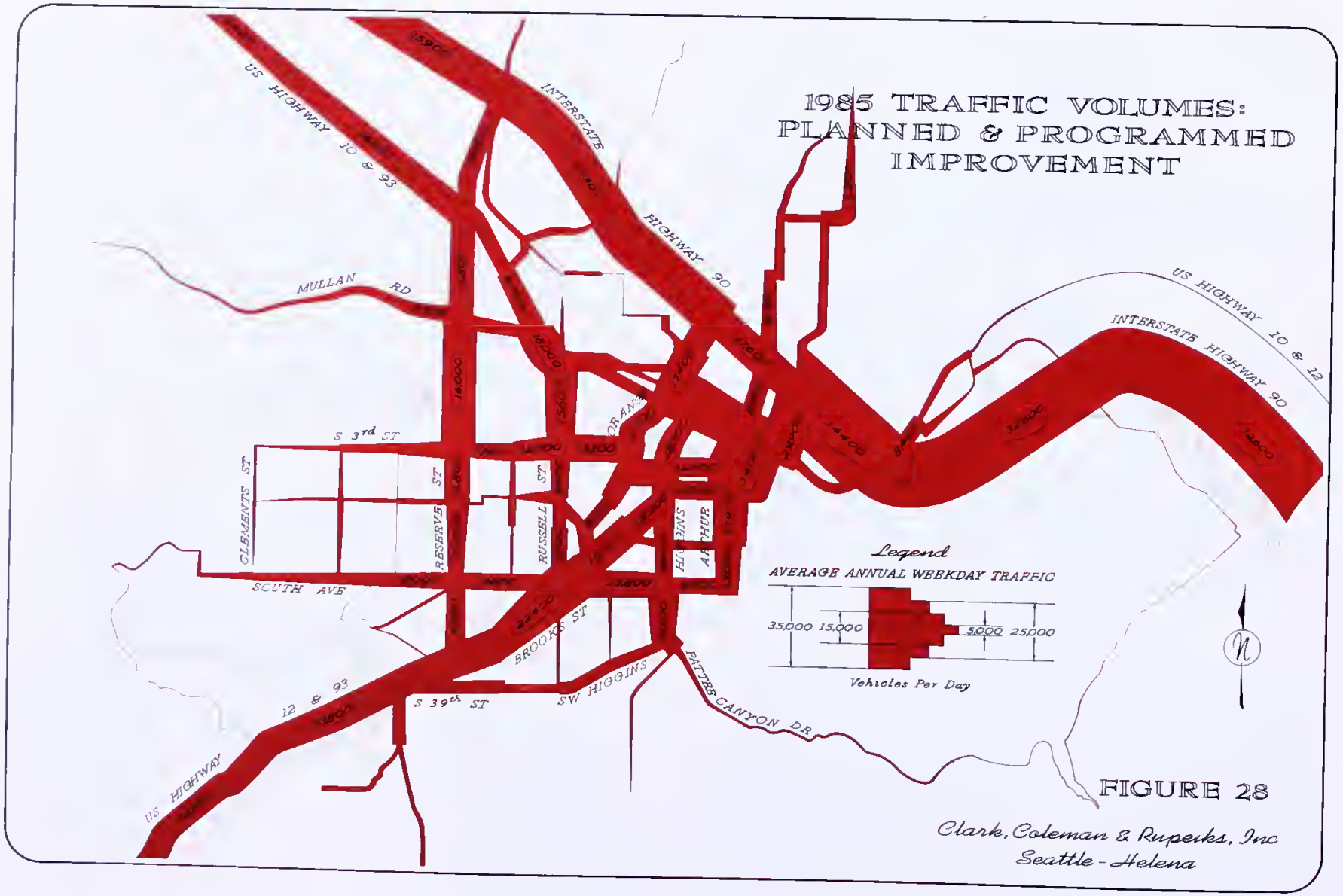


FIGURE 28

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decrease to 5,700 vehicles just east of VanBuren, to 8,400 vehicles in East Missoula, and to about 1,000 vehicles west of Milltown.

Volumes ranging from 8,400 to 16,100 vehicles per day are indicated on Reserve Street. Russell Street is estimated to carry volumes ranging from 7,500 vehicles north of South Avenue to 15,600 vehicles at the Clark Fork Bridge. Volumes on Higgins Avenue range from 15,000 vehicles south of Broadway to 10,300 vehicles on the bridge, to 23,000 vehicles north of Brooks Street, to 8,900 north of South Avenue, to 13,700 vehicles south of South Avenue, and decrease to 5,600 vehicles per day on sections of S. W. Higgins. On South 39th Street, traffic volumes are estimated at 4,100 vehicles per day.

Heavy traffic volumes are found on VanBuren and Madison Streets and on Arthur Avenue. On VanBuren Street, south of Interstate Highway 90, the traffic volumes amount to 29,900 vehicles. On Madison Street Bridge the volumes have increased to 34,000 vehicles. South of the bridge the heavy volumes split between Arthur Avenue and 5th-6th Street couplet. Volumes on Arthur Avenue vary from 10,800 vehicles to 17,900 vehicles per day. The 5th-6th Street one-way couplet is estimated to carry a continued volume of 22,400 vehicles per day.

Orange Street is expected to carry heavy volumes ranging from 11,100 vehicles on the Clark Fork River Bridge to 17,400 vehicles in the undercrossing of the Northern Pacific Railroad tracks. South of the bridge, Orange Street volumes are indicated at 17,300 vehicles between 3rd and 5th Streets. Stephens Avenue is estimated to carry between 7,700 and 9,100 vehicles per day while the volumes on Middlesex amount to 6,800 vehicles per day.

The estimated traffic volume on Brooks Street, southeast of Higgins Avenue, is 12,000 vehicles per day increasing to 16,100 vehicles per day north of South Avenue. Southwest of South Avenue, traffic volumes on Brooks Street gradually decrease from 22,400 vehicles, to 13,800 vehicles on the Bitterroot River Bridge, to 12,700 vehicles at the southern boundary of the Study Area.

Other heavier traffic volumes are found on Mullan Road with 7,500 vehicles, on sections of South 3rd Street with 13,100 vehicles, and South Avenue ranging from 4,000 to 13,800 vehicles. From the Rattlesnake Canyon, volumes of

8,800 and 4,500 vehicles are indicated on West and East Rattlesnake Roads, respectively.

In the CBD, the estimated traffic volumes were somewhat lower than anticipated. The trip end forecast and distribution models are unable to account for illogical round the block travel which always shows up on the ground count. Heavy traffic volumes were found on Broadway, Orange Street, Higgins Avenue and on Madison Street as discussed earlier. Estimated traffic volumes on Main Street amounted to 8,400 vehicles west of Higgins Avenue while volumes of 7,000 vehicles were found on Front Street, west of Higgins Avenue. Ryman, Pattee, Spruce and Pine Streets carried somewhat lesser volumes.

The forecasted 1985 traffic volumes shown in Figure 28 and discussed in previous paragraphs represent travel desires assuming an unlimited street capacity available for travel. The next logical step is to introduce the practical street capacities of each facility discussed. Comparison can then be made between street capacity and traffic volumes to determine if the facility is able to handle the desired load. If the volumes exceed the capacity, improvements should be planned. In many cases prior physical development and practical economic restraints limit the improvements that can be made to increase capacity of the facility. In this situation, alternative solutions achieved through analysis and adjustment of the streets and highway system will usually result in some relief.

Volume-Capacity Comparisons

Street capacity is determined by the physical characteristics of the street. Width of cross-section design, intersection design and spacing are the most important and permanent factors. However, capacity is also affected by variables such as signal timing and spacing, turning movements, number of commercial vehicles, parking, bus stops and land use. Parking and signal timing may vary during the day and are apt to change substantially over a period of years. Since all the factors affecting capacity cannot be estimated precisely for the future, a generalized definition of capacity has been employed. For planning purposes, street capacities are most conveniently expressed in 24-hour terms. Table VII-1 lists street capacities for arterial and collector streets in Missoula for various widths. As shown in the table, a typical two lane arterial street 40 feet wide, with curb parking, can accommodate 8,200 to 9,000 vehicles per day. The removal of curb parking will increase the capacity to 11,000 to 12,300 vehicles per day, an increase of about 35 percent.

TABLE VII - 1

STREET CAPACITY[a]

ARTERIAL STREETS[b]

Surface[c] Width	TWO WAY STREET With Parking	TWO WAY STREET No Parking	ONE WAY STREET Parking Both Sides	ONE WAY STREET Parking One Side	ONE WAY STREET No Parking
18 - 22		4,400- 5,700		3,000- 4,300	6,100- 7,700
22 - 26		5,700- 7,000		4,300- 5,600	7,700- 9,200
26 - 30		7,000- 8,300	3,900- 5,200	5,600- 6,800	9,200-10,800
30 - 34		8,300- 9,700	5,200- 6,500	6,800- 8,100	10,800-12,300
34 - 38	7,400- 8,200	9,700-11,000	6,500- 7,800	8,100- 9,400	12,300-13,800
38 - 42	8,200- 9,000	11,000-12,300	7,800- 8,800	9,400-10,600	13,800-15,300
42 - 46	9,000- 9,900	12,300-13,500	8,800-10,000	10,600-11,800	15,300-16,800
46 - 50	9,900-10,700	13,500-14,600	10,000-11,200	11,800-13,000	16,800-18,200
50 - 54	10,700-11,600	14,600-15,700	11,200-12,400	13,000-14,100	18,200-19,600
54 - 58	11,600-12,400	15,700-16,800	12,400-13,600	14,100-15,300	19,600-21,000
58 - 62	12,400-13,200	16,800-17,900	13,600-14,700	15,300-16,500	21,000-22,400
62 - 66	13,200-14,100	17,900-19,600			
66 - 70	14,100-14,900	19,600-20,200			
70 - 74	14,900-15,700	20,200-21,200			
74 - 78	15,700-16,500	21,200-22,300			
78 - 82	16,500-17,300	22,300-23,300			
82 - 86	17,300-18,100	23,300-24,300			
86 - 90	18,100-18,900	24,300-25,400			
90 - 94	18,900-19,700	25,400-26,400			

TABLE VII - 1 (Continued)

COLLECTOR STREETS[b]

Surface[c] Width	TWO WAY STREET With Parking	TWO WAY STREET No Parking	ONE WAY STREET Parking Both Sides	ONE WAY STREET Parking One Side	ONE WAY STREET No Parking
18 - 22		2,800- 3,600		1,900- 2,700	3,900- 4,900
22 - 26		3,600- 4,500		2,700- 3,500	4,900- 5,900
26 - 30		4,500- 5,300	2,500- 3,300	3,500- 4,400	5,900- 6,900
30 - 34		5,300- 6,200	3,300- 4,100	4,400- 5,200	6,900- 7,800
34 - 38	4,700- 5,200	6,200- 7,000	4,100- 5,000	5,200- 6,000	7,800- 8,800
38 - 42	5,200- 5,800	7,000- 7,800	5,000- 5,600	6,000- 6,700	8,800- 9,700
42 - 46	5,800- 6,300	7,800- 8,600	5,600- 6,400	6,700- 7,500	9,700-10,700
46 - 50	6,300- 6,800	8,600- 9,300	6,400- 7,100	7,500- 8,200	10,700-11,600
50 - 54	6,800- 7,400	9,300-10,000	7,100- 7,900	8,200- 9,000	11,600-12,500
54 - 58	7,400- 7,900	10,000-10,700	7,900- 8,600	9,000- 9,800	12,500-13,400
58 - 62	7,900- 8,400	10,700-11,400	8,600- 9,400	9,800-10,500	13,400-14,300
62 - 66	8,400- 9,000	11,400-12,100			
66 - 70	9,000- 9,500	12,100-12,800			

[a]Vehicles per day

[b]Capacities are based on the following: Peak hour factor = 80 percent; Load factor = 0.3; Peak hour = 12 percent of AWD; Right turns = 10 percent; Left turns = 10 percent; Trucks and through buses = 5 percent; Local transit - none. Arterial street green signal time = 55 percent; Collector street green signal time = 35 percent; Peak direction flow = 60 percent of peak hour flow; directional split = 55-45 percent.

[c]Measured in feet

Sources: Clark, Coleman & Rupeiks, Inc.; Highway Capacity Manual.

The comparison of assigned 1985 traffic volumes with street capacity on the system of present, planned and programmed facilities is shown in Table VII-2. Volume-capacity comparisons are shown for sections of major streets in a general travel corridor or across screenlines such as the Clark Fork River or the Northern Pacific Railroad. Figure 29 shows the same comparison in graphic form.

Estimated 1985 traffic volumes exceed the available street capacity of most major screenlines. In travel corridors that include Interstate Highway 90, the capacity exceeds the estimated volumes.

The 1985 traffic volume demand across the Northern Pacific Railroad tracks amounts to 72,900 vehicles per average weekday, while the capacity is only 58,300 vehicles per day. The probable closure of the Van Evan crossing would reduce the street capacity to 51,900 vehicles per day. The greatest volume-capacity differences occur at Orange and VanBuren Streets, both connecting with the Interstate Highway.

The estimated 1985 traffic volume across the Clark Fork River amounts to 91,000 vehicles per average weekday contrasted with a capacity of 64,200 vehicles per day. The traffic volume demand on the Madison Street Bridge is more than twice the available street capacity. The capacity deficiency across the three bridges, Orange, Higgins and Madison, south of the CBD, is more acute than in the corridor of Reserve and Russell Streets.

In the west and east corridors containing Interstate Highway 90, street capacity exceeds the estimated 1985 traffic volume. The Interstate Highway is contributing to the excess capacity for without it extreme congestion would occur on the local street system.

In the major travel corridors south of the Clark Fork River, the estimated 1985 traffic volume exceeds the available street capacity. In the south central corridor consisting of Stephens, Higgins and Arthur Avenues and Brooks Street, the estimated 1985 traffic volumes amount to 48,800, while the street capacity is only 36,100 vehicles per day. The estimated 1985 traffic volume at the intersection of Brooks, Russell and South also exceeds the available street capacity.

Other deficiencies of less magnitude are anticipated throughout the area, and will necessitate examining means of

TABLE VII - 2

COMPARISON OF TRAFFIC VOLUME AND STREET CAPACITY

Travel Corridor or Screenline	Traffic Volume[a]	Street Capacity	Volume/ Capacity
WEST CORRIDOR (East of Russell)			
Interstate Highway 90	21,500	40,000	0.54
Turner Street	1,900	5,200	0.36
Toole Street	5,000	8,200	0.61
West Broadway	7,000	6,500	1.08
Total	35,400	59,900	0.59
EAST CORRIDOR (East of VanBuren)			
Interstate Highway 90	34,400	40,000	0.86
East Broadway	5,700	5,700	1.00
Total	40,100	45,700	0.88
SOUTH-EAST CORRIDOR (Clark Fork River)			
Orange Street Bridge	11,100	8,600	1.29
Higgins Avenue Bridge	10,300	11,000	0.94
Madison Street Bridge	34,000	15,900	2.14
Total	55,400	35,500	1.56
SOUTH-CENTRAL CORRIDOR (South of 6th)			
Stephens Avenue	9,100	10,700	0.85
Brooks Street	12,000	8,600	1.40
S. Higgins Avenue	10,800	8,200	1.32
Arthur Avenue	16,900	8,600	1.96
Total	48,800	36,100	1.35

TABLE VII - 2 (Continued)

Travel Corridor or Screenline	Traffic Volume[a]	Street Capacity	Volume/ Capacity
SOUTH-WEST CORRIDOR (Clark Fork River)			
Reserve Street Bridge	16,100	13,800	1.17
Russell Street Bridge	15,600	12,400	1.26
Total	31,700	26,200	1.21
SOUTH CORRIDOR (Northeast of Brooks-South-Russell)			
Russell Street	7,500	8,600	0.87
Brooks Street	16,100	12,800	1.26
South Avenue	13,800	6,500	2.12
Total	37,400	27,900	1.34
RAILROAD SCREENLINE (N.P. Tracks)			
Reserve Street	9,000	13,800	0.65
Van Evan Crossing	2,700	6,400	0.42
Orange Street	17,900	8,300	2.16
Madison Street	8,800	9,900	0.89
VanBuren Street	29,900	12,900	2.32
East Broadway	4,600	7,000	0.66
Total	72,900	58,300	1.25
RIVER SCREENLINE (Clark Fork River)			
Reserve Street Bridge	16,100	13,800	1.17
Russell Street Bridge	15,600	12,400	1.26
Orange Street Bridge	11,100	8,600	1.29

TABLE VII - 2 (Continued)

Travel Corridor or Screenline	Traffic Volume[a]	Street Capacity	Volume/ Capacity
RIVER SCREENLINE (Clark Fork River) (Continued)			
Higgins Avenue Bridge	10,300	11,000	0.94
Madison Street Bridge	34,000	15,900	2.14
County Road 46	3,900	2,500	1.56
Total	91,000	64,200	1.42
SOUTH SCREENLINE (South of 6th)			
Clements Street	1,400	5,700	0.24
Tower Street	2,300	5,300	0.43
Hiberta Street	500	4,800	0.10
Reserve Street	11,900	8,600	1.38
Johnson Street	2,700	6,100	0.44
Russell Street	8,100	8,600	0.94
Franklin Street	900	5,700	0.16
Stephens Avenue	9,100	10,700	0.85
Brooks Street	12,000	8,600	1.40
S. Higgins Avenue	10,800	11,600	0.93
Arthur Street	16,900	11,700	1.44
Total	76,600	87,400	0.88

[a] 1985 Average weekday traffic in vehicles per day

Source: Clark, Coleman & Rupeiks, Inc.

COMPARISON : 1985 TRAFFIC VOLUMES AND STREET CAPACITY IN MAJOR TRAVEL CORRIDORS

Planned, Programmed System of Streets and Highways

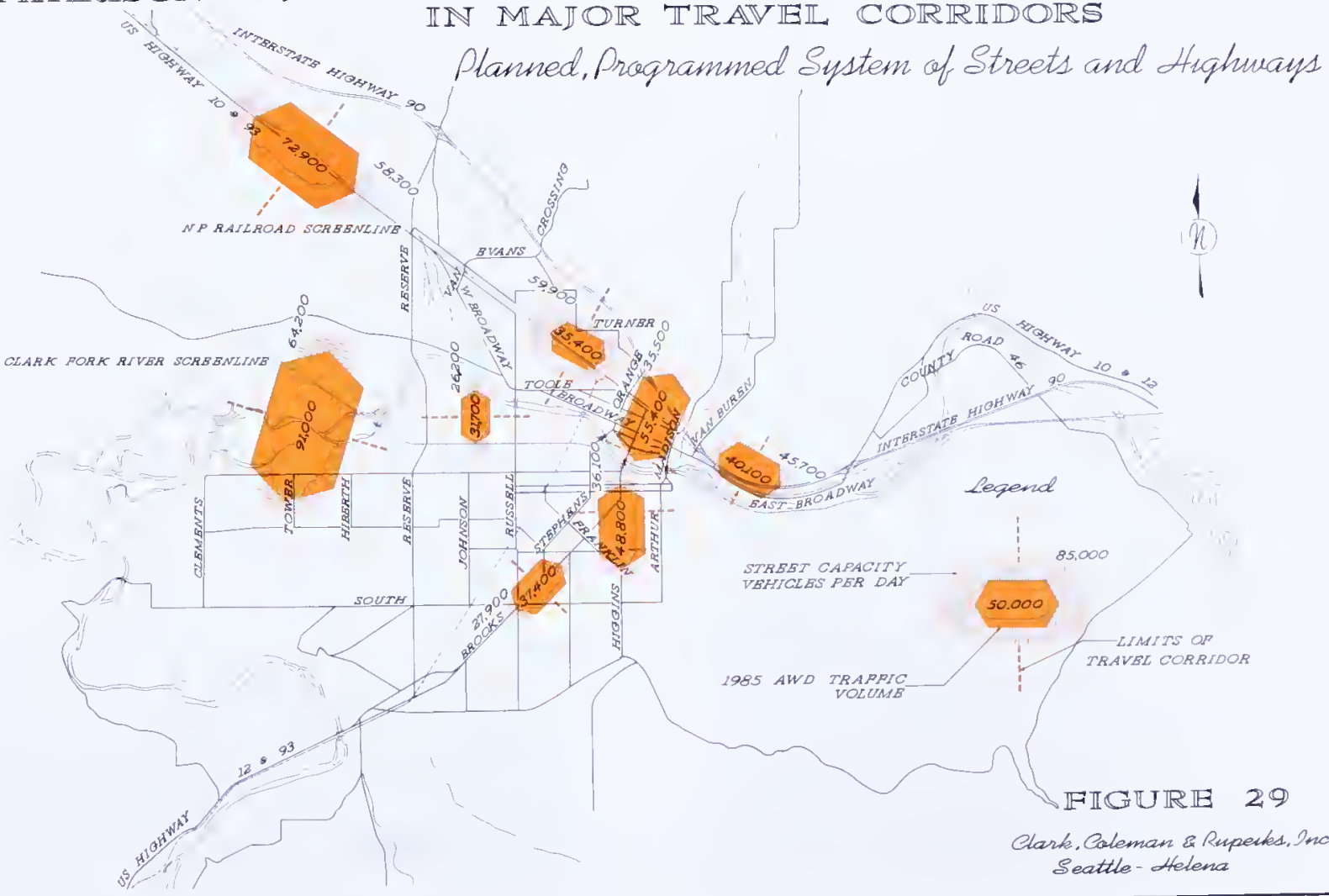

FIGURE 29

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overcoming localized as well as corridor deficiencies. A study of these deficiencies is vital to the analysis of future transportation needs and the development of the transportation plan.

Analysis of Future Travel Needs

Examination of capacity deficiencies across major screenlines and in travel corridors points to six major problem areas requiring solution. These problem areas include the crossings of the Northern Pacific Railroad tracks and of the Clark Fork River, access to the Interstate Highway 90, access to the CBD, circulation in the vicinity of the University of Montana and traffic flows through the intersection of Russell, Brooks and South. In developing the recommended transportation plan, solutions to these problems are translated into types of facilities based on preliminary studies of traffic volume needs, field reconnaissance and location elements. The alternative solutions to these problems are discussed in detail in the following sections.

Railroad Crossing. The location of Interstate Highway 90 on the north side of the Northern Pacific Railroad tracks creates a track crossing demand of about 72,900 vehicles per day by 1985. The currently existing and planned-programmed crossing facilities are not adequate for the demand and additional grade separated arterial street facilities must be provided.

Grade separated crossings of the tracks exist now at Orange, VanBuren and East Broadway. An additional grade separated crossing at Reserve Street is programmed for construction. All four connect to interchanges on the Interstate Highway system and will be loaded heavily with passenger and commercial vehicles on long distance travel. Additional grade separated railroad crossing facilities are needed at Orange Street to facilitate Interstate Highway-oriented travel and in the area between Orange and Reserve to facilitate local travel between residential, industrial and commercial areas.

Various alternative crossings of the Northern Pacific Railroad tracks in the vicinity of Orange Street were investigated and evaluated. The alternatives consisted of the following: an overcrossing in line with Owen Street, an overcrossing in line with Woody Street, an undercrossing parallel to present facility, and an improvement of 2nd Street North with an overcrossing at Madison Street.

Evaluations indicated that the construction of an undercrossing parallel with the existing facility would prove most feasible and economical.

The probable closure of the Van Evan crossing limits access to the area north of the Northern Pacific Railroad tracks and west of the Rattlesnake Valley to Reserve, Orange and Madison Streets. As indicated earlier, the Reserve and Orange Street crossings serve the Interstate Highway-oriented traffic and the Madison Street crossing tends to serve the Rattlesnake Valley traffic. An additional crossing to this area thus becomes necessary.

Locations for the additional grade separated crossings were investigated at Lincoln Street, Scott Street and Worden Avenue. The evaluations indicated that the construction of an overcrossing of the tracks in line with Scott Street would prove most feasible.

The traffic carrying capacity of the section of VanBuren Street between the Interstate Highway and East Broadway can be increased by extending VanBuren Street south across East Broadway. This requires construction of a new crossing of the Clark Fork River or construction of ramps for free flow of traffic on the north end of Madison Street Bridge. The extension of VanBuren Street eliminates the necessity for left turns off of East Broadway at VanBuren and at Madison. The capacity of the section of VanBuren crossing the tracks is thus increased considerably.

River Crossing. The Clark Fork River, in the past and to an extent at present, is a natural barrier separating business and industry of the north side from the predominantly residential use of the south side. With the advent of the automotive age, some of the commercial and industrial use moved south along U. S. Highway 93, but automobile trip making between the home and the areas of business and industry often requires crossing the river. Bridges have been built and rebuilt. The Higgins Avenue Bridge has been reconstructed, the Madison Street Bridge has replaced the old VanBuren Street Bridge and the Russell Street Bridge has replaced the old California Street Bridge. The Orange Street Bridge is still in good usable condition and a new bridge at Reserve Street is planned for construction.

The average weekday traffic volumes in 1965 crossing the river amounted to 49,400 vehicles per day. The 1985 average weekday traffic volumes crossing the river have been estimated at 87,100 vehicles per day, an increase of about 77 percent. The traffic carrying capacity of the

bridges, including the planned Reserve Street Bridge amounts to 61,700 vehicles per day. The alternatives are two: an additional bridge can be constructed or access to the present bridges can be improved.

The traffic carrying capacity of a river bridge in Missoula is dependent entirely upon the capacity of its approaches. The bridge can carry only as much traffic as can pass through the signalized intersection at its ends. In the case of Higgins Avenue Bridge, the bridge section itself is capable of carrying 1,200 to 1,800 vehicles per lane per hour resulting in a twenty-four hour capacity of 30,000 to 45,000 vehicles. However, the capacity of Higgins Avenue at Front Street and at South 5th Street limits the capacity of the bridge to 11,000 vehicles per day.

Various river crossing alternatives were considered and evaluated. A crossing of the Clark Fork River west of the confluence with the Bitterroot River was considered. This westerly crossing would pass to the west of the airport and connect to U. S. Highway 93 south of Missoula in the vicinity of Hayes Creek area, about four miles north of Lolo.

A crossing of the Clark Fork River in line with Scott Street was evaluated and was considered not feasible. At Orange Street, a parallel structure on either side of the present structure was considered. The widening of the present structure at Orange Street was evaluated and considered not feasible. A parallel structure on the east side appears desirable.

Improved access to the Madison Street Bridge at both approaches was considered feasible. On the north side, free flowing ramps to the east connecting with VanBuren Street south of East Broadway was considered. On the south side, a continuation of the bridge roadway section south across 5th and 6th Streets to ground level on Arthur Avenue in the vicinity of Eddy Street was considered. Conflicts with the irrigation canal and the railroad spur on the south side of Madison Street Bridge would make the circulation plans shown in the University of Montana Master Plan difficult to implement.

Finally, a crossing of the Clark Fork River in line with VanBuren Street was considered. On the south shore, the approaches will either have to curve to the east and tie

in with a major facility at the toe of the hill, east of the campus, or curve west and connect with the 5th and 6th one-way couplet.

Interstate Highway Access. The construction of Interstate Highway 90 through Missoula will do more to improve the level of service than any other planned or programmed improvement. The construction of such a facility requires a tremendous capital investment, however, and the community should make every effort toward maximum utilization.

Through the four interchanges with Interstate Highway 90, an estimated 58,200 vehicles will enter and leave the Missoula area each day. The feeder arterial road to the Grant Creek interchange, programmed for construction, will provide good access and can accommodate the estimated 1985 volume demand of about 8,400 vehicles per day. The connecting arterial road to the interchange in East Missoula is also adequate and can accommodate the estimated 1985 volume demand of about 4,600 to 8,400 vehicles per day. However, access to the Orange and VanBuren interchanges is difficult under present operating conditions, and since they carry volumes of 17,900 and 29,900 vehicles per day, should be improved. The four interchanges should be fully integrated with the system of primary arterials to provide adequate street capacity.

Improvement of access to the Orange Street interchange has already been discussed. A parallel undercrossing of the Northern Pacific Railroad tracks and the construction of a parallel structure along the present Orange Street Bridge, with appropriate street widenings, would improve current conditions.

Making the Interstate Highway more accessible at VanBuren Street requires either construction of an additional bridge across the Clark Fork River or construction of direct access to Madison Street Bridge. The easterly extension of Spruce and Pine Streets connecting with VanBuren Street between the Northern Pacific Railroad tracks and East Broadway was evaluated and not considered feasible because of space limitations.

CBD Access. The CBD, as the center of commerce, business and services, is the largest single traffic generator. Congestion free arterial street facilities to and from the central area, as well as by-pass facilities, are necessary for maintenance of the investment and insuring future growth.

The radial arterial routes serving the CBD are East and West Broadway, Orange and Madison Streets and Higgins

Avenue. Traffic movements to and from the CBD will take place on these facilities. The by-pass routes carrying traffic not desiring to enter the area, are Interstate Highway 90 on the north, Madison Street on the east, the 5th and 6th Street one-way couplet on the south and Orange Street on the west.

Detailed discussion of the internal circulation elements in the CBD will follow in Chapters VIII and IX. However, mention should be made of the 5th and 6th Street one-way couplet and its effect on the CBD circulation.

Currently, the 5th and 6th Street one-way couplet extends between Orange and Madison Streets. It functions very effectively in diverting east and west traffic not desiring to enter the CBD. The location of the couplet on the south side of the river eliminates the necessity of locating a major arterial route on the north side between the river and the central area.

University of Montana. In 1965, a total of 10,253 vehicle trips originated or terminated on the University of Montana campus. The number of trips ends is estimated at 33,400 by 1985. Provision of adequate arterial street facilities becomes necessary to handle the future traffic load with a minimum of congestion.

Natural land formations, such as Mount Sentinel east of the University campus, control and channel the major traffic flows. In Missoula the corridor of east-south traffic movement passes adjacent to the University campus. Since unity within the campus should be maintained, a major arterial route serving both the University's traffic needs and providing for the east-south movements should be provided.

A number of alternative arterial route locations around the University campus were investigated. One consisted of a new crossing of the Clark Fork River at VanBuren Street, connecting with the 5th and 6th Street one-way couplet, swinging east along the foot of Mount Sentinel, south past the student housing development, diagonally through the golf course and terminating at the intersection of South Higgins Avenue and Pattee Canyon Drive. On the west side of the campus various alternative improvements along Arthur Avenue, where traffic volumes ranging from 10,800 to 17,900 vehicles per day are expected by 1985, were considered. One alternative extended Arthur Avenue

south of South Avenue diagonally through the golf course and connecting with Southwest Higgins Avenue at the intersection with Pattee Canyon Drive. Rather than providing an arterial route through the golf course, consideration was also given to major channelization at Arthur and South Avenues and at the intersection of South and Higgins Avenues to channel the flows from Arthur to South to Higgins Avenues.

Brooks Street. Brooks Street, as a designated U. S. Highway and a major arterial route leading into the CBD, carries substantial traffic volumes. Volumes in 1965 on sections of Brooks Street amounted to about 14,000 vehicles per day. Its width was inadequate to carry that volume of traffic as well as the estimated future loads of 12,000 to 22,400 vehicles per day. The Montana Highway Commission budgeted funds and programmed Brooks Street and the remainder of U. S. Highway 93 for improvement between Higgins Avenue on the north to Lolo on the south. Roadway widening from the Buckhouse Bridge over the Bitterroot River to Lolo is underway. Design and construction drawings are currently being prepared for the section of Brooks Street north of the Bitterroot River.

Alternatives for improvement of Brooks Street were considered. Special consideration was given to the section between Mount and Higgins to allow the retention of trees in the street right-of-way between the curb and the sidewalk. One-way couplets with either Woodford Street on the west or Blaine Street on the east were considered. The effects on residential property values with widening of this section of Brooks Street, were also considered.

The alternative of improving Orange and Middlesex Streets, and Stephens Avenue in lieu of Brooks Street was considered desirable and feasible. This alternative permits retention of trees on Brooks between Higgins and Mount. Various alternative traffic circulation schemes were developed at the intersection of Russell, Brooks and South. Grade separation as well as channelization schemes were investigated. Realignment of Brooks between Paxson Street and the Buckhouse Bridge on the Bitterroot River was considered desirable.

CHAPTER 8

CHAPTER VIII TRANSPORTATION PLAN

In developing a transportation plan, the planned network must be derived from clearly established objectives, and with an appreciation of planning restraints. Acceptable planning concepts, achieved through careful integration of the plan elements, must also be reflected. Prior inventories and forecasts of land development, population, and employment distribution, and travel patterns have established the probable size, shape and internal activity of the 1985 Missoula urban area.

An evaluation of the adequacy of present street and highway facilities, together with planned and programmed improvements, in serving future travel needs reveals the major problem areas for which the transportation plan must find the best solution. These considerations have been discussed previously and will be applied here in the development of a transportation network for the Missoula area.

PLAN COMPONENTS

The elements of a transportation plan vary from one urban area to another, depending upon the complexities and variable factors dictating transportation needs. To achieve a proper balance and an efficient transportation service, each component must be developed to accommodate anticipated demand throughout the entire transportation system. In the Missoula area, the transportation plan will include:

- Roadway facilities to serve automobile dominated travel demand, including high-capacity freeways, arterial streets, collector and local service streets.
- Off-street parking and terminal facilities located in strategic areas in each of the sections of high trip attractions.

Interstate Highway 90 will provide service not previously available in the area. Travelers on long distance trips, formerly using U. S. Highway 10, are now provided with a high capacity facility that has separated opposing traffic lanes and has eliminated crossing conflicts with highways and railroads.

The arterial street system in Missoula is the primary element in the transportation plan. Collector and local streets provide access to the various land uses.

In an automobile dominated transportation system, parking and terminal facilities are vital elements. To keep pace with future parking needs, existing terminal facilities must be expanded and new ones developed. A detailed plan for parking in the CBD is presented in Chapter IX.

Transit service should be an integral part of the Comprehensive Transportation Plan. Limited transit service is essential to the economic well being of the community and should be considered as a public service to the aged and the young unable to operate motor vehicles on the public rights-of-way. The effects of transit service on auto trip making and on arterial street facilities requirements are minimal. However, potential transit service requirements will be evaluated and the results published in a separate report.

ALTERNATE PLANS STUDIED

By careful examination of future deficiencies in the arterial street system, the extent of improvements required in the travel corridors was determined. Based on these requirements, tentative plans were developed for each corridor and were supplemented by field reconnaissance to evaluate feasibility and impact on adjacent land development. Alternate plans were examined in areas where development costs appeared high and land use influences critical.

Alternate plan studies were made for several routes. The principal such study was conducted for the east-south corridor movement adjacent to the University of Montana campus. This corridor, which tends to follow Arthur Avenue, had estimated 1985 traffic volumes as high as 17,900 vehicles per day. The future demand for a high-capacity facility, designed to serve both intermediate and long trips, is apparent.

The alternate plan called for construction of a bridge across the Clark Fork River in line with VanBuren Street. The northern approach of the bridge would connect with the Interstate Highway interchange at VanBuren Street, crossing East Broadway at grade. The southern approach would connect with the 5th and 6th Street one-way couplet and would proceed eastward toward the foot of Mount Sentinel. Curving south, a four lane divided arterial street would run east of the University of Montana campus and the student housing complex along the base of the mountain. Entering onto the present golf course, east of the inter-

section of South Avenue and Maurice Street, the route would gradually curve southward, connecting with Southwest Higgins Avenue at the intersection with Pattee Canyon Drive. The route would have controlled access, allowing intersections with University parking areas in the vicinity of the present physical plant, at Beckwith Street and again at South Avenue.

The estimated 1985 daily traffic volumes on this route would range from a low of 10,700 through the golf course to a high of 18,100 vehicles on the section between Beckwith Street and South Avenue. Figure 30 shows the estimated 1985 traffic flow on this section of the roadway as well as its effect on other sections of the system. Marked effects are noted in traffic volumes on the Madison Street Bridge, on Arthur Avenue and on Brooks Street.

The observed 1985 traffic volume of 9,600 vehicles per day on Arthur Avenue could easily be accommodated within the existing street width with installation of traffic control devices to permit cross traffic to enter the campus parking areas and to provide for pedestrian crossing safety. The estimated 1985 traffic volume of 6,200 vehicles per day on Brooks Street between Higgins and Middlesex would not require street widening, permitting retention of the trees.

Selected link analysis was first done to determine the pattern of traffic flow throughout the urban area culminating on that section of arterial street east of the campus. Further analysis was carried out to determine the other facilities that would be used by these volumes if such a facility was not constructed. The results revealed that an additional 8,000 vehicles would travel on Arthur Avenue and an additional 8,500 vehicles on Brooks Street. The remaining 1,600 vehicles per day would be scattered on other minor links throughout the system. From the standpoint of established transportation planning objectives, this route was considered superior to the other alternatives. However, from the standpoint of planning restraints, this location conflicted with the long-range development plans for the University of Montana campus. After many conferences between the Missoula City-County Planning Board and the administrative staff of the University of Montana, the route east of the campus was abandoned in favor of the Arthur Avenue route. Newly constructed student housing in line with Arthur Avenue, south of South Avenue, and the long range plans for the development of research facilities on the present golf course precluded the extension of Arthur Avenue through the golf course to S. W. Higgins Avenue. Channelization patterns were developed to route traffic from Arthur to South and to Southwest Higgins Avenue.

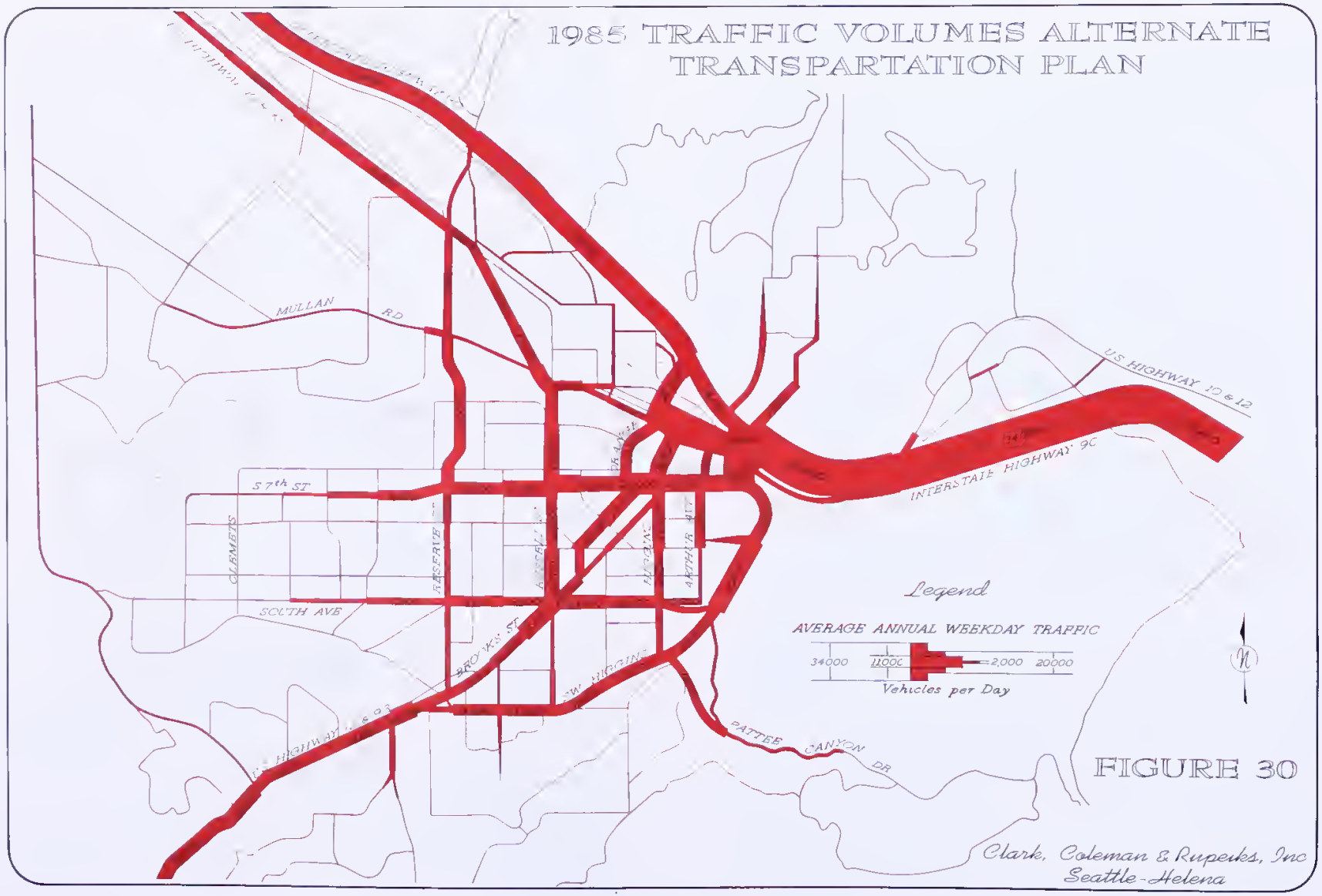
1985 TRAFFIC VOLUMES ALTERNATE
TRANSPARTATION PLAN
MULLAN RD
S 7th ST
CLEMETS
RAYSFAVE
SOUTH AVE
BROADWAY ST
ARTHUR ST
US HIGHWAY 10 & 12
INTERSTATE HIGHWAY 90
PATTEE CANYON DR
Legend
AVERAGE ANNUAL WEEKDAY TRAFFIC
34000
11000
2,000
20000
Vehicles per Day
N
Clark, Coleman & Rupenks, Inc
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FIGURE 30

RECOMMENDED TRANSPORTATION PLAN

The recommended network of freeways, arterials and collector streets for the Missoula area is shown in Figure 31. In keeping with primary objectives, the plan provides for present and future traffic demand and land service requirements with an acceptable level of service. It also establishes a structure within which the community can grow and develop.

The recommended transportation plan is a blending of many factors. The plan emanates from prior street plans that have evolved over the years. The existing street network exerts a strong influence, and existing and future land uses are an integral element. The arterial street network has been planned for implementation and is economically feasible. The specific proposals of the plan are designed to satisfy 19B5 forecast conditions, but are flexible and can be modified to serve the need a few years earlier or later than 1985. The estimated 1985 average weekday traffic flow on the recommended plan system is shown in Figure 32.

Freeways

Interstate Highway 90 provides the only freeway facility in the area. The need for additional freeway facilities within the next twenty years is not apparent.

West of the Study Area, the Interstate Highway provides an interchange with U. S. Highway 10-A and 93. Proceeding easterly, the Interstate Highway enters the Study Area north of the County Airport and forms a diamond interchange with Reserve Street and Grant Creek Road. Proceeding in a southeast direction, the Interstate Highway forms a partial diamond interchange with Orange Street. Traveling further, the Highway crosses over Madison Street and Rattlesnake Creek, forming a diamond interchange with VanBuren Street. East of VanBuren Street the Highway continues north of the Northern Pacific Railroad track and forms a diamond interchange with East Broadway in East Missoula. Proceeding easterly, the Interstate Highway crosses the Clark Fork River twice and forms a trumpet interchange with U. S. Highway 10 in Milltown, west of the confluences of the Blackfoot and the Clark Fork Rivers. Outside the Study Area, the Interstate Highway crosses the Northern Pacific Railroad tracks and the Blackfoot River and proceeds eastward.

Through Missoula, the freeway has been constructed to Interstate Highway standards. Two median separated travel lanes in each direction are provided. The roadway is designed for high travel speeds in the vicinity of 70 miles per hour. The estimated 1985 daily traffic volumes on the section of Interstate 90 through Missoula range

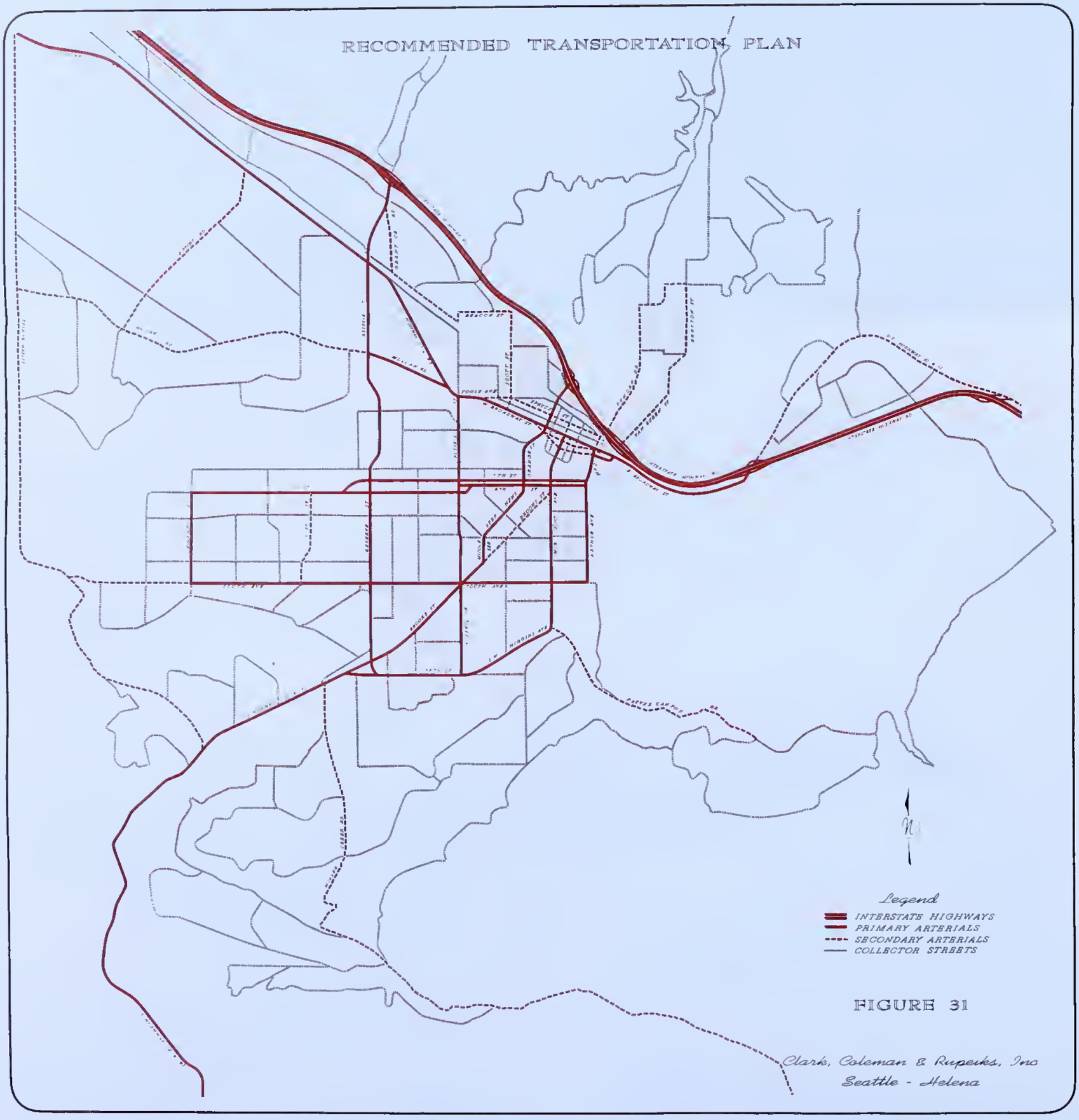
RECOMMENDED TRANSPORTATION PLAN
Legend
INTERSTATE HIGHWAYS
PRIMARY ARTERIALS
SECONDARY ARTERIALS
COLLECTOR STREETS
N
Clark, Coleman & Rupeiks, Inc
Seattle - Helena

FIGURE 31

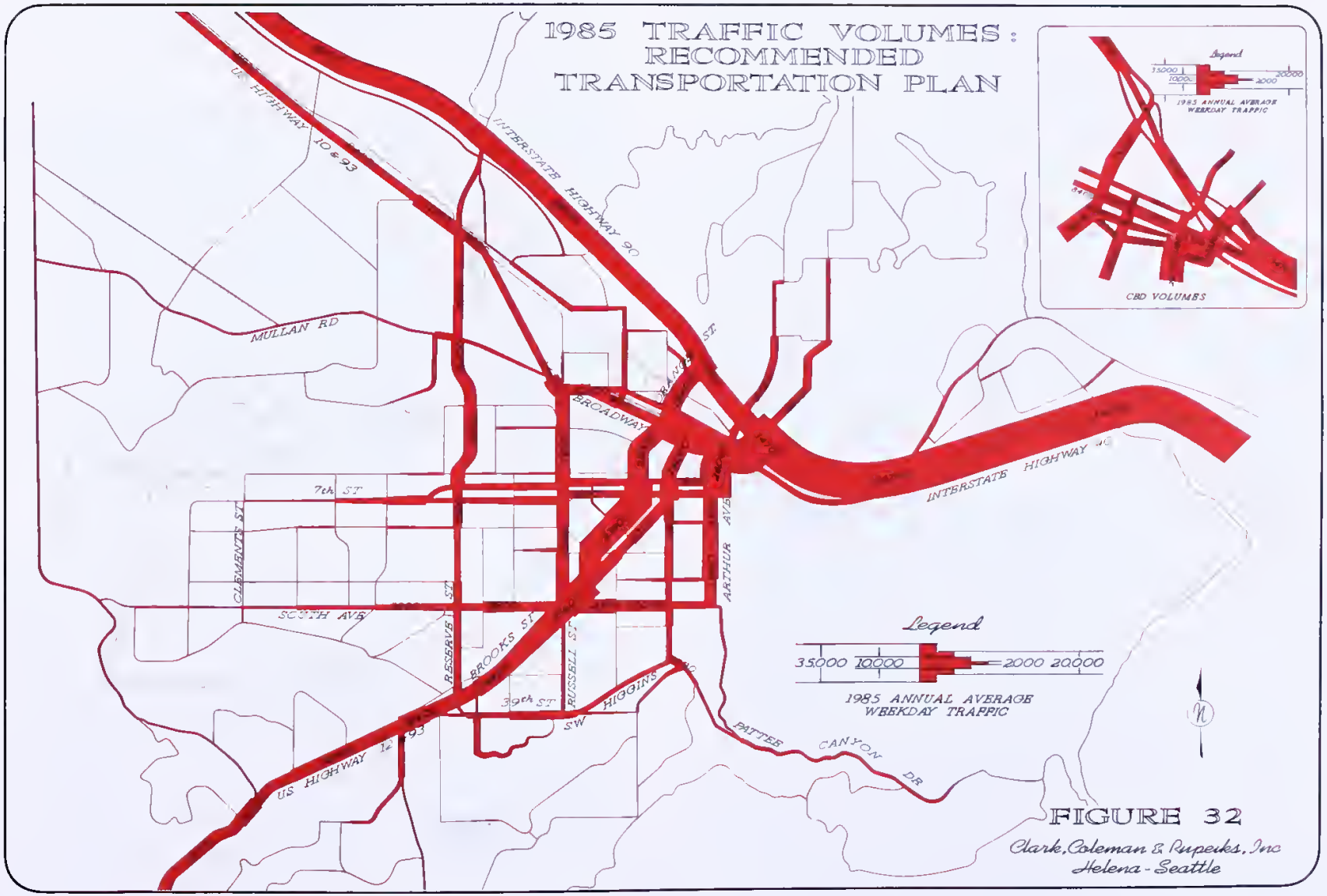

FIGURE 32

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from a low of about 14,900 vehicles between the Orange and VanBuren Street interchanges to a high of about 34,700 vehicles between the VanBuren and East Missoula interchanges. The low traffic volume between the Orange and VanBuren Street interchanges is the result of through travelers, in about 7,200 vehicles, turning off the freeway for the purpose of automobile or personal services. The estimated 1985 traffic volume on the Interstate Highway entering the Study Area from the west is 16,200 vehicles per day and increases to 34,000 at the eastern limits of the Study Area. A total of about 58,200 vehicles will exit and enter the Interstate Highway via the four interchanges in the Study Area by 1985.

Primary Arterials

The primary arterials connecting with the Interstate Highway 90 are Reserve Street, Orange Street, VanBuren Street and Broadway. Other primary arterials are Higgins Avenue, 39th Street, Brooks Street, Russell Street, 5th, 6th, 7th Streets, Clements Avenue, South Avenue and sections of Mullan Road and Madison Street.

Reserve Street. Reserve Street, beginning at the Interstate Highway interchange with Grant Creek Road, proceeds south crossing the Northern Pacific Railroad tracks and U. S. Highway 10 and 93, forming an interchange with U. S. Highway 10 and 93. Reserve Street proceeds south as a limited access facility intersecting Mullan Road at grade. Further south, Reserve Street crosses Clark Fork River in a northwest, southeast direction, crosses the Chicago, Milwaukee & St. Paul Railroad tracks on a structure and connects with 3rd, 5th and 7th Streets at grade. Proceeding south, Reserve Street crosses South Avenue, connects with the new alignment of Brooks Street and terminates at an intersection with 39th Street. The estimated 1985 traffic volume on Reserve Street ranges from a low of about 6,400 vehicles per day on the section north of South Avenue to 11,300 vehicles per day at the crossing of the Clark Fork River.

Orange Street. Orange Street, beginning at the interchange with the Interstate Highway, proceeds south, passes under the Northern Pacific Railroad tracks and intersects with Broadway, Front and Main Streets and crosses Clark Fork River. South of the river, Orange Street intersects with 5th and 6th Streets and connects with Stephens Avenue. Following southwest along Stephens Avenue, the primary arterial route turns onto Middlesex Avenue and terminates at the intersection with Brooks Street. The estimated 1985

traffic volumes range from 15,300 vehicles per day north of Broadway, to 26,200 vehicles per day on Stephens Avenue.

VanBuren-Madison-Arthur. VanBuren Street, beginning at the intersection with the Interstate Highway 90 and proceeding south, crosses under the Northern Pacific Railroad tracks and intersects Broadway at grade. Proceeding south, VanBuren Street crosses Broadway and connects to Madison Street Bridge via free flowing ramps. South of the Madison Street Bridge, the arterial crosses over 5th and 6th Streets and follows along Arthur Avenue to South Avenue. The estimated 1985 traffic volumes range from 16,400 vehicles per day on sections of Arthur to 32,300 vehicles per day south of the Interstate Highway interchange.

Broadway. East Broadway connects with the Interstate Highway in East Missoula. Proceeding west, East Broadway parallels the Interstate Highway and the Northern Pacific Railroad Tracks to the north and the Clark Fork River to the south. West of Madison Street, Broadway becomes the major east-west arterial through the CBD, crossing Higgins Avenue and Orange Street. West of Orange Street and out of the CBD core, Broadway crosses Russell Street, swings northwest across Mullan Road, connects with Reserve Street and continues west past the Missoula County Airport. The estimated 1985 traffic volumes on Broadway range from 4,400 vehicles per day south of the Interstate Highway interchange in East Missoula to 15,500 vehicles per day between VanBuren and Madison.

Higgins Avenue-39th Street. Higgins Avenue, beginning in the CBD at the intersection with Broadway, proceeds south, crosses the Clark Fork River, connects with the 5th and 6th Street one-way couplet and with Brooks Street and South Avenue. Proceeding south, Higgins Avenue angles to the southwest at the intersection with Pattee Canyon Drive. At about Russell Street, Higgins Avenue joins 39th Street, proceeds due west and terminates at an intersection with the new alignment of Brooks Street. The estimated 1985 traffic volumes range from a high of 18,600 vehicles per day north of Pattee Canyon Drive to a low of about 1,900 vehicles per day east of the new alignment of Brooks Street.

Brooks Street. The primary arterial section of Brooks Street begins at the intersection with Middlesex Avenue. Proceeding in a southwesterly direction, Brooks Street intersects with Russell Street and South Avenue in a six leg intersection. Brooks Street intersects Reserve Street, crosses over the Northern Pacific Railroad spur line,

crosses the Bitterroot River and proceeds south on the west bank of the river to Lolo. U. S. Highway 93, at present, is routed along Brooks Street. The estimated 1985 traffic volumes on Brooks Street range from 25,600 vehicles per day southwest of Middlesex Avenue, to 12,100 vehicles per day north of Reserve Street.

Russell Street. Russell Street follows a straight north-south line between Broadway and 39th Street. Beginning at the intersection with Broadway, Russell Street crosses the Clark Fork River, travels under the Chicago, Milwaukee & St. Paul Railroad tracks, intersects with the 5th, 6th and 7th Street one-way couplet, intersects with South Avenue and Brooks Street and terminates at the intersection with 39th Street. The estimated 1985 traffic volumes on Russell Street range from 12,700 vehicles per day on the Clark Fork River Bridge, to 2,800 vehicles per day north of the intersection with 39th Street.

5th, 6th and 7th Streets and Clements Avenue. The 5th and 6th Street one-way couplet between Madison Street and Orange Street, in addition to being a major cross-town facility, functions as an east-west collector-distributor road to the CBD. The radials, or access-egress points to the CBD are provided by Orange, Higgins and Madison Street Bridges. West of Orange Street, the 5th and 6th Street one-way couplet extends to Russell Street. East of Russell Street, the eastbound leg of the couplet reverts from 6th to 7th Street. West of Russell Street the 5th and 7th Street couplet extends to Reserve Street. West of Reserve Street the couplet reverts to a two-way street along 7th Street, turning south at Clements Avenue. The estimated 1985 traffic volumes on the 5th, 6th and 7th Street one-way couplet range from 15,600 vehicles per day east of Russell Street to 11,100 vehicles per day east of Reserve Street. On the two-way section west of Reserve Street, the estimated 1985 traffic volumes range from 9,700 vehicles per day west of Reserve Street, to 1,600 vehicles per day east of Clements Avenue. On Clements Avenue the estimated 1985 traffic volume amounts to about 1,100 vehicles per day.

South Avenue. South Avenue follows an east-west line between Clements and Arthur Avenues. The major cross streets from west to east are Reserve Street, Russell-Brooks Streets, and Higgins Avenue. The estimated 1985 traffic volumes on South Avenue range from a low of about 2,800 vehicles per day east of Clements Avenue, to 11,900 vehicles per day west of Higgins Avenue.

Mullan Road and Madison Street. A section of Mullan Road between Reserve Street and West Broadway, is in the primary arterial system. The estimated 1985 traffic volume on this section amounted to about 3,500 vehicles per day. The other short section of primary arterial is on Madison Street between the Clark Fork River Bridge and Broadway, where an estimated 1985 traffic volume amounted to about 7,100 vehicles per day.

Secondary Arterials

The secondary arterials in the recommended transportation plan are: the northerly by-pass, along Big Flat Road; the westerly extension of South Avenue, west of Clements Avenue; Mullan Road, west of Reserve Street; South Airport Road; Scott-Beacon-Raeser Drive; 31st Avenue; the eastern branch of Miller Creek Road; Brooks Street between Middlesex and Higgins Avenues; Pattee Canyon Drive; Duncan and Brayton Drives in Rattlesnake Canyon; U. S. Highway 10 from East Missoula to Milltown; and Spruce, Main and Front Streets and part of Higgins Avenue in the CBD.

Westerly By-pass. The plan shows a westerly by-pass, along Big Flat Road, west of the confluence of Clark Fork and Bitterroot Rivers. The by-pass extends south from the intersection of U. S. Highways 10 and 93 west of the County Airport and outside the Study Area to U. S. Highway 93 south of the Bitterroot River in the vicinity of Hayes Creek. The estimated 1985 traffic volume on this section is about 2,300 vehicles per day.

South Avenue. The transportation plan shows South Avenue extended west across the Bitterroot River and connecting with the Westerly By-pass along Big Flat Road. The estimated 1985 traffic volume on this section of secondary arterial amounts to about 1,900 vehicles per day.

Mullan Road. The recommended plan shows Mullan Road west of Reserve Street as a secondary arterial extending west to Frenchtown. The estimated 1985 traffic volumes ranged from a high of 6,600 vehicles per day west of Reserve Street to a low of about 1,200 vehicles per day east of the Westerly By-pass route.

South Airport Road. The Figure 31 shows a secondary arterial route southeast of the airport, at the bottom of the bluff, between Mullan Road and U. S. Highway 10. The estimated 1985 traffic volume on this section is less than 1,000 vehicles per day.

Scott-Beacon-Raeser Drive. The recommended transportation plan shows Scott Street as a secondary arterial, starting north of Broadway and crossing the Northern Pacific Railroad tracks on a structure. On the north side of the tracks, the route follows along Scott Street to Beacon to Raeser Drive to the former Grant Creek Road, terminating at an intersection with Reserve Street south of the Grant Creek interchange with the Interstate Highway 90. The estimated 1985 traffic volumes along this route amount to 2,800 vehicles per day on Scott Street, 1,900 vehicles per day on Beacon Street, and 1,200 vehicles per day on Raeser Drive.

31st Avenue. The plan indicates 31st Avenue between South Avenue and 7th Street as secondary arterial. The route flanks the site of the new high school to the east. The estimated 1985 traffic volume on this section of the route is less than 1,000 vehicles per day.

Miller Creek Road. The transportation plan shows Miller Creek Road and its eastern branch as a secondary arterial. The estimated 1985 traffic volumes range from 2,100 to 6,100 vehicles per day.

Brooks Street. Brooks Street between Higgins and Middlesex Avenues has been designated as a secondary arterial in the plan. The estimated 1985 traffic volumes in the tree-lined section range from 10,300 to 11,300 vehicles per day.

Pattee Canyon Drive. Pattee Canyon Drive is shown as a secondary arterial on the recommended plan. The estimated 1985 traffic volumes range from less than 1,000 vehicles per day in the canyon, to 7,500 vehicles per day east of Higgins Avenue.

Duncan and Brayton Drives. The recommended transportation plan shows Duncan and Brayton Drives in Rattlesnake Canyon as secondary arterials connected on the north in the vicinity of 30th Street North. The estimated 1985 traffic volumes range from 7,800 to 3,200 vehicles per day on Duncan Drive and from 3,200 to 8,200 on Brayton Drive.

U. S. Highway 10 East. The U. S. Highway 10, northeast of the East Missoula interchange with Interstate Highway 90, is shown as a secondary arterial on the plan. The estimated 1985 traffic volumes on this section of the road range from less than 1,000 vehicles per day to as high as 6,200 vehicles per day north of the interchange.

Spruce Street. The recommended transportation plan shows Spruce Street in the CBD as a secondary arterial. The estimated 1985 traffic volumes on Spruce Street range from 4,800 vehicles per day to 7,500 vehicles per day.

Main and Front Streets. The recommended transportation plan shows Main and Front Streets as secondary arterials. The estimated 1985 traffic volumes on Main range from 4,600 to 12,500 vehicles per day. The estimated 1985 traffic volumes on Front Street range from 6,300 to 11,000 vehicles per day.

Higgins Avenue. Higgins Avenue in the CBD between Spruce and Broadway is shown as a secondary arterial in the recommended transportation plan. The estimated 1985 traffic volumes range from 8,000 to 11,000 vehicles per day.

Collector Streets

The recommended transportation plan shows a network of collector streets. In the developed areas, the collector streets follow along dedicated rights-of-way. However, in the fringe or undeveloped areas, the collector streets are recommended for development in the general corridors. Subdivision designs and topographical limitations finally determine the exact locations of these collector streets.

TRAVEL COMPARISONS

Summaries of total vehicle miles and vehicle hours of travel for the recommended transportation plan and the previously discussed alternative plan are listed in Table VIII-1. The miles of roadway and average travel speed for the two networks are also given.

On the basis of travel statistics, the recommended transportation plan does not differ greatly from the alternate plan. A marked difference, however, exists in the configuration of the two systems.

In the recommended plan, the freeway system, amounting to about 6.3 percent of the system mileage, carries 33.1 percent of the total vehicle miles. The high travel speeds on the freeway reduce the vehicles' operating hours to about 20.3 percent of the total travel time. At the other extreme, the collector street system amounts to about 45.9 percent of the entire system mileage and carries only 7.9 percent of the total vehicle miles. The low usage of the collector system is a result of the inclusion of a large number of low traffic volume carrying facilities in the fringe areas.

TABLE VIII - 1

1985 TRAVEL COMPARISONS

System	Length	Percent	Vehicle Miles	Percent	Vehicle Hours	Percent	Average Speed
Recommended Plan							
Freeway	11.7	6.3	283,000	33.1	4,700	20.3	59.84
Freeway Ramps	3.2	1.7	5,900	0.7	200	0.9	38.43
Primary Arterials	47.3)	46.1)	497,400	58.3)	15,300	66.2)	32.42
Secondary Arterials	38.8)						
Collectors	85.9	45.9	67,400	7.9	2,900	12.6	23.43
Total	186.9	100.0	853,700	100.0	23,100	100.0	30.11
Alternate Plan							
Freeway	11.7	6.2	286,600	33.4	4,800	20.9	59.85
Freeway Ramps	3.2	1.7	6,400	0.7	200	0.9	37.91
Primary Arterials	47.4)	45.8)	492,100	57.4)	14,800	64.3)	33.22
Secondary Arterials	39.0)						
Collectors	87.2	46.3	72,800	8.5	3,200	13.9	22.96
Total	188.5	100.0	857,900	100.0	23,000	100.0	30.21

Source: Clark, Coleman & Rupeiks, Inc.

About 46.1 percent of the entire system mileage is in primary and secondary arterial streets capturing about 58.3 percent of the total vehicle miles traveled. The vehicle hours of travel on the arterial street system amounted to about 66.2 percent of the total. The average speed on the arterial streets was 32.42 miles per hour. The long stretches of U. S. Highways 10, 12 and 93 with 50 mile per hour speed limits contribute to the high travel speeds.

An obvious conclusion from this table is that emphasis should be put on improving the arterial street system. The freeway system is complete and the collector street system can be brought along as the needs indicate.

CHAPTER 9

CHAPTER IX CENTRAL BUSINESS DISTRICT TRAFFIC CIRCULATION AND PARKING PLAN

Central Business District activities such as retailing, government, finance, offices, entertainment and transient housing compete with each other for ease of traffic access and for convenient and economical parking. Through traffic, having both the origins and destinations outside the central area, competes with local traffic for street space. The causes and effects of alternative solutions to traffic circulation and parking problems in the central area are quite complex. For this reason, circulation and parking are singled out and treated in more detail than the general transportation plan, although the recommendations will fully integrate with the overall plan.

The growth of the CBD, in terms of retail sales volume, bank deposits, etc., has been slower than in the suburban commercial areas. This condition is often interpreted by central area businessmen as a decline in economic activity of the downtown and tangible causes for the decline are sought. In Missoula, the one-way operation of Main and Front Streets is being blamed for problems that are more likely caused by a shortage of convenient and economical parking and a lack of innovations in merchandising.

Many positive developments recently completed, underway or announced, however, are significant indications that the CBD will remain strong and will be able to maintain a competitive position with the suburban commercial centers. A decision was made by the major department stores to relocate and rebuild in the CBD. The post office is relocating its facility in the central area and Interstate Highway 90 interchange points at Orange and VanBuren Streets tend to foster commercial development in the central area.

This new development in the CBD appears as a multitude of individual projects unrelated to each other and to the existing development. What is now needed is a definite course of action, integrating these projects to augment economic growth. This approach tends to alleviate conditions conducive to deterioration. No single answer or "shot-in-the arm" solution can provide more than a temporary benefit, simply because the situation must be approached from a broader point of view.

The following sections of this chapter present a basic traffic circulation and parking plan for the Missoula CBD.

CURRENT TRAFFIC CIRCULATION AND PARKING

The primary traffic carrying facilities in the CBD are Orange Street, Higgins Avenue, Madison Street and Broadway. Other streets perform more of a collector and local access street function. In 1965, the average weekday traffic volumes on Broadway ranged from 10,000 vehicles per day west of Orange Street, to 12,500 vehicles per day west of Higgins Avenue. The traffic volumes on Orange Street ranged from 7,200 vehicles per day north of Broadway, to 10,900 vehicles per day on the Orange Street Bridge. The 1965 average weekday traffic volumes on Higgins Avenue ranged from 11,800 vehicles per day north of Broadway, to 15,900 vehicles per day north of Main Street. The traffic volumes on Madison Street ranged from 9,300 vehicles per day south of Broadway, to 9,800 vehicles per day on the Madison Street Bridge. The 1965 average weekday traffic volumes on CBD streets are shown in Figure 3.

At present, Broadway, Higgins Avenue and Madison Street are designated U. S. Highway routes and carry substantial numbers of through trips. U. S. Highway 10 is routed along Broadway, U. S. Highway 12 follows along Madison Street and east along East Broadway, and U. S. Highway 93 follows Higgins Avenue and west Broadway. Orange Street, as part of the State Primary Highway System, does not carry a U. S. Highway designation.

The other major traffic carrying streets in the CBD are Front, Main, Spruce, Ryman and Pattee. Front and Main Streets operate as a one-way couplet between Orange and Madison Streets. Spruce Street is functioning as an east-west collector while Ryman and Pattee Streets provide primarily local access to commercial and governmental establishments.

A fixed-time traffic signal control is provided along Broadway at intersections with Orange, Ryman, Pattee Streets and Higgins Avenue. The traffic signal installation at Broadway and Madison Street is traffic actuated. Other fixed-time traffic signals in the CBD are located at the intersection of Orange, Front, Main and along Higgins Avenue at intersections with Spruce, Pine, Main and Front Streets. The 1965 traffic volumes exceed the available street capacity on one or more approaches at all the signalized intersections on Higgins Avenue except at Spruce Street. The 1965 traffic volume/capacity comparisons are shown in Table II-2.

In 1965, the average weekday traffic volume on Main Street west of Higgins Avenue amounted to 5,800 vehicles per day. On Front Street, west of Higgins Avenue, the volume amounted to about 4,900 vehicles per day. The Front and Main Streets one-way couplet is not a very effective traffic carrying facility, due to a serious problem area at the intersection with Orange Street. At the east end of the couplet, the two streets terminate practically at a dead end along Madison Street. Front Street terminates in a right turn onto Madison Street southbound or at a left turn to Main Street. The fact that access to Main Street westbound at Madison Street is difficult is borne out by low traffic usage of the facility. This one-way couplet must begin and terminate in a major flow of traffic, helping to relieve the heavy vehicular volumes on Broadway.

Parking in the CBD has been covered in detail in Chapter V. In summary, the spatial distribution of the 5,133 parking spaces results in a deficit of about 104 short-term and 203 long-term parking spaces in the critical area surrounding the intersection of Higgins Avenue and Main Street.

PLAN FRAMEWORK AND ELEMENTS

The CBD traffic circulation system should be composed of various functional elements. Easy and convenient access should be provided by high traffic carrying radial facilities. Traffic desiring to by-pass the CBD should be facilitated on a peripheral loop surrounding the central area. A distributor loop of major facilities should surround the CBD core, carrying traffic from radials and internal arterial facilities to well-located parking facilities. Centrally located parking structures or lots should be provided for shoppers and other short-term users, while outlying lots should be available for all-day parkers.

The traffic circulation plan for the CBD, indicating the peripheral loop, the radials, the internal arterials and the distributor loop, is shown in Figure 33.

Radials. The radial facilities provide for the introduction of movements from outside areas directly into the peripheral loop to facilitate distribution of traffic to all parts of the CBD with minimal disruption and congestion.

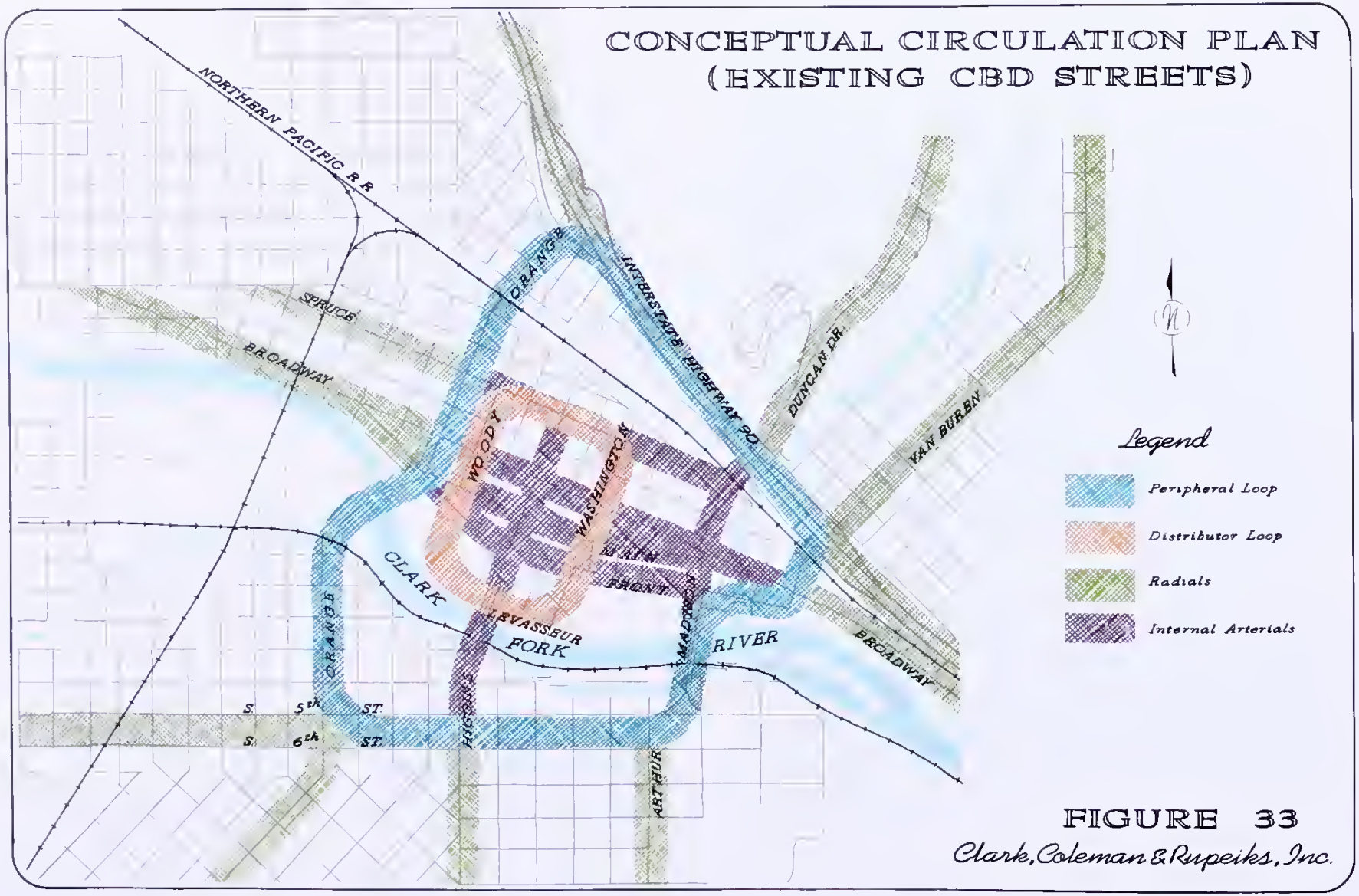


FIGURE 33

Clark, Coleman & Rupeiks, Inc.

In Missoula, the radial facilities include parts of Interstate Highway 90, Duncan Drive, VanBuren Street, East Broadway, Arthur Avenue, Higgins Avenue, Orange Street, 5th and 6th Streets, West Broadway and Spruce Street.

Peripheral Loop. The peripheral loop encourages the diversion of through traffic and distributes CBD traffic. It will accommodate movements around the district to destinations on the opposite side, and movements to points in the central area. Traffic on the peripheral loop should be given priority over cross traffic and limits should be placed on conflicting turning movements. Its location at the periphery of the commercial area fosters the most efficient movement of such traffic, and provides high accessibility to nearby vehicular-oriented activities.

In Missoula, the peripheral loop consists of VanBuren-Madison Street, 5th and 6th Streets, and Orange Street, and the section of Interstate Highway 90 between Orange and VanBuren Streets.

Internal Arterials. Internal arterials provide direct routes from one side of the central area to the opposite side, and support the peripheral system by carrying some through traffic across the central area during the peak travel flow periods. In most cases, the internal arterials are extensions of the radial routes.

The internal arterial facilities in the CBD are Spruce Street, Broadway, Main Street, Front Street, Higgins Avenue and Madison Street.

Distributor Loop. The distributor loop connects to the peripheral loop by internal arterials and allows for direct distribution of traffic to sub-areas of the CBD and to the parking facilities. The distributor loop connects with local access streets, but has priority of traffic movement. The basic orientation is to the shopper seeking parking space.

In the CBD, the distributor loop consists of Spruce Street, Washington Street, the LeVasseur Street extension and Woody Street to Spruce Street.

Local Access Streets. Local access streets provide for direct access of traffic to individual properties and establishments. The required flexibility of movement is provided by two-way streets and complete freedom of turning. All streets in the CBD not previously mentioned fall into the local access category.

PLAN FOR TRAFFIC CIRCULATION AND PARKING

The objectives of transportation planning and the framework of functional elements of CBD traffic circulation should be analyzed with respect to two parameter restraints: the existing street configuration and the estimated future traffic volumes.

The existing street system evolved under different circumstances, but must be adapted to future needs with a minimum of new construction. The estimated future traffic loads on the central area streets have been discussed in Chapter VIII and are illustrated in Figure 32. The Central Business District Traffic Circulation and Parking Plan has been prepared to provide the necessary capacities for accommodation of the estimated 1985 volumes of traffic. The plan is shown in Figure 34.

Access to the CBD

Travel barriers in Missoula, such as the Clark Fork River, the Northern Pacific Railroad and the surrounding hills, limit access to the CBD to a few well-defined arterials. Certain sections of these arterials form the peripheral loop while others continue through the central area.

One of the primary access routes to the CBD is Interstate Highway 90, connecting with the arterial street system at the Orange Street Interchange. An estimated 10,600 vehicles per day in 1985 will enter or leave the arterial street system to or from the west.

Access to the central area and to the peripheral loop is also provided by Spruce Street. This section of the arterial street system will become one of the major access routes to industrial and residential areas north of the railroad tracks via the Scott Street overcrossing. The maximum 1985 estimated traffic volume on Spruce between Scott and Orange Streets is 6,400 vehicles per day.

From the west, Broadway will remain as one of the primary traffic-carrying radials to the CBD, although the construction of Interstate Highway 90 has lessened the traffic load. Broadway is estimated to carry a maximum of 14,000 vehicles per day west of Orange Street.

The Clark Fork River limits radial access to the CBD from the south to the three bridges at Orange Street, Higgins Avenue and Madison Street. South of the 5th and 6th Street one-way couplet, the estimated 1985 traffic volumes amounted to 26,200 vehicles per day on Orange Street,

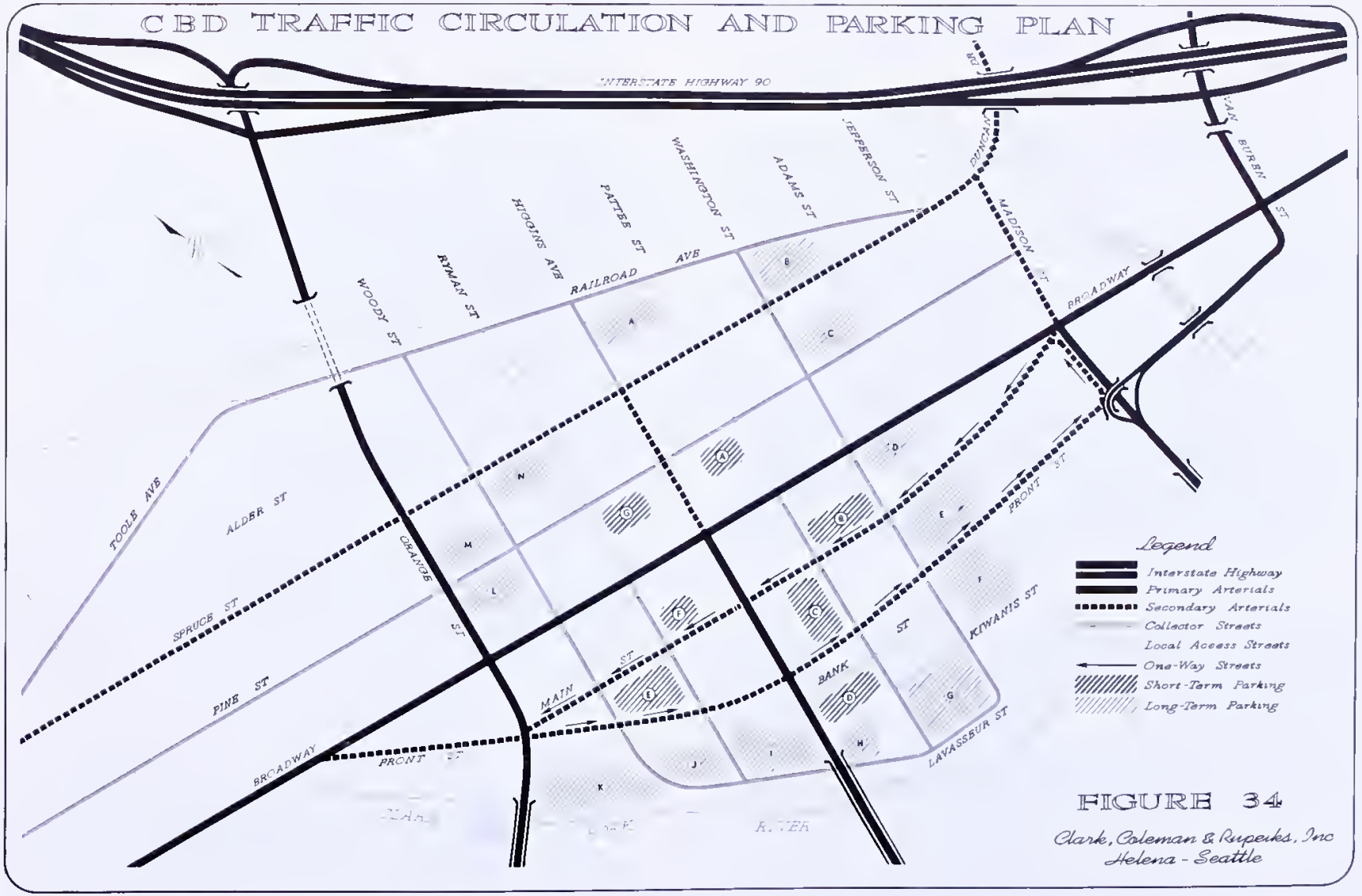


FIGURE 34

Clark, Coleman & Rupeiks, Inc
Helena - Seattle

18,600 vehicles per day on Higgins Avenue and 13,300 vehicles per day on Arthur Avenue south of Madison Street Bridge. The 5th and 6th Street one-way couplet, west of Orange Street has an estimated 1985 traffic volume of 15,000 vehicles per day.

East Broadway is one of the major radial routes to the CBD. East of VanBuren Street, the 1985 traffic volume on East Broadway amounts to 5,300 vehicles per day. Interstate Highway 90 from the east interchanging with the arterial street system at VanBuren Street, has an estimated 1985 traffic volume of 25,200 vehicles per day. Not all of this traffic is destined for the central area, however. The estimated 1985 volume of 7,200 through trips per day on the Interstate Highway will make a stop in the CBD for the purpose of personal or vehicle service.

From Rattlesnake Canyon, the two radial routes are Duncan Drive and VanBuren-Brayton Street. Duncan Drive is the only radial route that does not tie in with the peripheral loop road. The estimated 1985 traffic volume on Duncan Drive at the Northern Pacific Railroad crossing amounts to 8,400 vehicles per day. The VanBuren-Brayton facility connects with the Interstate Highway, Madison Street Bridge and Arthur Avenue. The estimated 1985 traffic volume on VanBuren north of the Interstate Highway amounts to 8,200 vehicles per day. A substantial part of this traffic is destined for areas other than the CBD.

The streets proposed to constitute the peripheral loop provide for efficient traffic distribution. The physical limitations of the peripheral loop encourage usage by through traffic. The section of the loop as a distributor functions most effectively along the 5th and 6th Street one-way couplet. Traffic destined for the CBD from the south selects a river crossing in relation to the central area destination and makes the necessary maneuver to the selected crossing along the 5th and 6th Street couplet.

The estimated 1985 traffic volumes on the peripheral loop range from a low of 14,900 vehicles per day on the section of Interstate Highway 90, to 32,300 vehicles per day on VanBuren Street.

Circulation Within the CBD

Improvement of traffic circulation in the CBD core area is usually accomplished by application of traffic engineering measures. Improved signalization, pedestrian control, removal of curb parking, channelization, one-way street

operation and minor street widening are some of the possible improvements. In Missoula, in addition to the application of traffic engineering measures, an opportunity exists to construct sections of new street forming a distribution loop.

In the core area, sections of Spruce Street function as internal arterials, connecting the peripheral loop with the distributor loop. On Spruce Street, the 1985 estimated traffic volumes have a maximum of 7,000 vehicles per day between Washington and Madison Streets.

Broadway, between Orange and VanBuren Streets, will remain one of the most heavily traveled streets in the CBD. The traffic carrying capacity of Broadway limits its usage to about 15,000 vehicles per day. To achieve this capacity, curb parking on one side must be removed and turn lanes at intersections installed. Because of capacity limitations, Broadway is expected to carry about 15,000 vehicles per day by 1985.

The parallel streets, such as the Front and Main one-way couplet, will assume greater role in traffic movement as Broadway approaches its capacity. At the eastern terminus channelization should be used to improve westbound access. As a result, Main Street, in 1985, is estimated to carry traffic volumes ranging from a low of 4,600 vehicles per day west of Madison Street, to 11,100 vehicles per day east of Higgins Avenue. Substantial improvements on Front Street are required, from street widening to extension of Front Street east across Madison Street. The 1985 traffic volumes on Front Street are estimated to vary from 6,300 vehicles per day west of Orange Street, to 11,000 vehicles per day west of Higgins Avenue.

As an internal arterial, Higgins Avenue, between Spruce Street and the 5th and 6th Street one-way couplet, is expected to serve almost entirely CBD oriented traffic. The 1985 estimated traffic volumes range to 15,000 vehicles per day on the section south of Broadway.

Madison Street, between the Clark Fork River Bridge and the intersection with Duncan Drive, functions as an internal arterial. However, large amounts of non-CBD traffic is carried on this section of the route. The estimated 1985 traffic volumes on this section of Madison Street have a high of 10,700 vehicles per day south of Spruce Street.

The distributor loop south of Front Street, on the river bench, and beneath Higgins Avenue Bridge, conforms with the plans being implemented to beautify the riverfront. Some of the right-of-way is required to extend Woody Street from Main Street to LeVasseur on the riverfront. Realignment of Washington Street between Main and Front Streets is required to line up with Clay Street.

The CBD streets not previously considered will have a local service function intended to maximize vehicular accessibility to establishments. Ryman and Pattee Streets are examples of local access streets.

CBD PARKING PLAN

The City of Missoula and CBD property owners should cooperatively develop a system of well-located off-street parking facilities to serve current and future short and long-term parking needs. These facilities should be developed in addition to the existing supply of off-street parking and estimated future curb parking. A nominal fee should be charged in relation to the duration of parking space usage.

The recommended system of short and long-term off-street parking facilities for the CBD is shown in Figure 34. The locations and boundaries of the recommended parking areas should not be interpreted as exact in terms of property acquisition for development. The recommendations only designate the general vicinity where a parking facility should be developed. Whether the recommended facility takes the shape of a lot or a parking structure depends upon economic conditions prevailing at the time of implementation. Some of the recommended sites are already in parking development and, in these instances, the plan merely recommends a continuation in parking use.

1985 Short-Term Parking Needs

In 1965 the available short-term parking supply amounted to about 10,980 space hours compared to a demand of about 8,930 space hours. The application of researched parking characteristics to spatial distribution of supply and demand resulted in a need for an additional 104 short-term parking spaces. The street capacity needed for relatively congestion-free traffic circulation by 1985 will require the removal of about 260 short-term curb parking spaces, resulting in a loss of about 1,860 space hours of short-term parking supply. The net parking supply available for 1985 amounts to about 9,110 space hours.

The 1985 short-term parking supply, demand, surpluses and deficiencies by analysis zone are shown in Table IX-1. The estimated 1985 short-term parking demand exceeds the net available supply by about 3,020 space hours. Considering walking distances and other short-term parking characteristics on a sub-area basis, the need for additional off-street short-term parking in 1985 amounts to about 615 spaces. Various sites for short-term off-street parking are shown on the Central Business District Traffic Circulation and Parking Plan.

It is recommended that the short-term off-street parking lot, labeled A, situated in the block bounded by Pine, Pattee, Broadway and Higgins, be expanded to the east to encompass the land presently occupied by the City Library. This expansion would increase the parking supply from the present 61 spaces to about 90 spaces. The development of the site labeled B, situated in the block bounded by Broadway, Washington, Main and Pattee is recommended. The entire half block, developed into short-term parking, will be able to accommodate about 140 off-street spaces.

The short-term parking area labeled C on the plan is situated in the block bounded by Main, Pattee, Front and Higgins. Currently, part of this area is in short-term parking use providing a total of 44 spaces. The development of this site as a surface lot will accommodate about 77 short-term parkers. The land at this location may become so valuable in a few years that the operation of a surface lot is no longer economical. To maintain this area in short-term parking, a multi-level parking structure should be erected. A four level structure, one sub-floor and two above street levels, could accommodate about 260 short-term off-street spaces, an increase of about 220 spaces.

The short-term parking area labeled D on the plan and situated in the block surrounded by Bank, Pattee, Kiwanis and Higgins Avenue Bridge, is presently in short and long-term parking use. The entire area should be developed in short-term use, providing a total of about 120 spaces.

The short-term parking area labeled E on the plan, situated in the triangular piece of land bounded currently by Main, Ryman, and Front Streets, should be developed as a short-term off-street parking facility. This area currently has nine short-term parking spaces. The development of the entire area in short-term off-street parking would provide a total of about 180 spaces.

TABLE IX - 1

1985 SHORT-TERM PARKING SUPPLY, DEMAND, SURPLUS AND DEFICIENCY[a]

Anal Zone[b]	1965 Supply	1985 Curb Loss	1985 Net Supply	1965 Needs	1985 Demand	1985 Total Demand	1985 Surplus	1985 Deficiency
01	497	72	425		666	666		241
02	513	108	405		667	667		262
03	1,122	108	1,014		1,147	1,147		133
04	1,137	151	986		558	558	428	
05	302	165	137	356	818	1,174		1,037
06	992	108	884	136	1,164	1,300		416
07	614	216	398		806	806		408
08	542	180	362		378	378		16
09	1,140	86	1,054		603	603	451	
10	238	79	159		84	84	75	
11	798	137	661		796	796		135
12	672		672		568	568	104	
13	611	259	352	211	947	1,158		806
14	805	94	711		881	881		170
16	867	101	766		1,321	1,321		555
17	127		127		28	28	99	
TOTAL	10,977	1,864	9,113	703	11,432	12,135	1,157	4,179

[a]Space hours

[b]See Figure 11 for analysis zone boundaries

Source: Clark, Coleman & Rupeiks, Inc.

The development of the site labeled F, situated in the block bounded by Broadway, Higgins, Front and Ryman, is recommended for short-term off-street parking. Currently, this land is unused. The dimensions of the site are too restrictive for a parking structure; however, a partial, open structure of a sub- and a street floor could be constructed to provide about 50 short-term off-street spaces.

The short-term parking area labeled G on the plan, situated in the block surrounded by Pine, Higgins, Broadway and Ryman, should be expanded to the west to encompass the land area presently in residential and all-day parking use. This expansion would increase the short-term spaces to about 110 spaces.

The estimated 1985 short-term off-street parking needs have been summarized in Table IX-2. At full development, the CBD will be able to provide open short-term parking in seven well-located facilities with about 950 spaces. To give this level of short-term parking service, the City and the CBD property owners should acquire land and develop parking amounting to about 660 short-term off-street spaces.

1985 Long-Term Parking Needs

In 1965 the available supply of long-term parking was about 18,970 space hours. The demand amounted to about 12,730 space hours. Taking into consideration parking characteristics and the spatial distribution of supply and demand, long-term parking shows a deficiency of about 203 long-term off-street spaces. The street capacity needed for relatively congestion-free traffic circulation by 1985 necessitates the removal of about 270 long-term curb parking spaces, resulting in a loss of about 2,180 space hours. The net long-term parking supply available in 1985 amounts to about 16,790 space hours.

The 1985 long-term parking supply, demand, surpluses and deficiencies by analysis zone are shown in Table IX-3. The estimated 1985 long-term parking demand exceeds the net available supply by about 5,580 space hours. Considering walking distances and other long-term parking characteristics on a sub-area basis, the resultant need for additional off-street long-term parking in 1985 amounts to about 1,290 off-street spaces. Various sites for long-term off-street parking are shown on the Central Business District Traffic Circulation and Parking Plan. The amount

TABLE IX - 2

1985 SHORT-TERM PARKING NEEDS

Facility	Full Development	Current Supply	Net Increase in Supply
A	90	61	29
B	140	39	101
C	260	44	216
D	120	75	45
E	180	9	171
F	50	-	50
G	110	64	46
TOTAL	950	292	658

Source: Clark, Coleman & Rupeiks, Inc.

of long-term parking displaced by development of short-term parking facilities amounted to about 110 spaces. This becomes an additional long-term parking need to be relocated in off-street facilities.

The development of site labeled A, situated in the block bounded by Alder, Pattee, Spruce and Higgins, is recommended for long-term parking. Currently this one-half block contains 91 parking spaces in long-term parking use. The entire half block, if developed in long-term parking, will be able to accommodate 130 off-street spaces.

The long-term parking area labeled B on the plan is situated in the block surrounded by Railroad, Adams, Spruce and Washington. Currently, only a small portion of this area is in long-term parking use, amounting to 6 spaces. The development of this site as a long-term parking lot will accommodate about 170 automobiles.

It is recommended that site C on the plan, situated in the block surrounded by Spruce, Adams, Pine and Washington be developed into long-term parking use. Currently the site contains 45 long-term and 25 short-term parking spaces. The entire half block could accommodate a total of 130 long-term spaces.

TABLE IX - 3

1985 LONG-TERM PARKING SUPPLY, DEMAND, SURPLUS AND DEFICIENCY[a]

Anal. Zone[b]	1985 Supply	1985 Curb Loss	1985 Net Supply	1965 Needs	1985 Demand	1985 Total Demand	1985 Surplus	1985 Deficiency
01	90		90	50	966	1,016		926
02	60		60		2,163	2,163		2,103
03	366		366		1,117	1,117		751
04	367		367		959	959		592
05	4,214		4,214		1,421	1,421	2,793	
06	780		780	248	1,035	1,283		503
07	225	43	182		907	907		725
08	1,577	115	1,462		1,420	1,420	42	
09	2,510		2,510		1,048	1,048	1,462	
10	1,298		1,298		1,086	1,086	212	
11	2,543	108	2,435		3,345	3,345		910
12	700		700		444	444	256	
13	210		210	1,314	1,148	2,462		2,252
14	670	187	483		1,130	1,130		647
16	3,148	1,511	1,637		2,557	2,557		920
17	216	216			16	16		16
TOTAL	18,974	2,180	16,794	1,612	20,762	22,374	4,765	10,345

[a]Space hours

[b]See Figure 11 for analysis zone boundaries

Source: Clark, Coleman & Rupeiks, Inc.

The long-term parking area labeled D on the plan, situated in the block bounded by Broadway, Adams, Main and Washington, is recommended for development. At full development, the site could provide 110 spaces. Currently the site contains thirteen long-term spaces and nine short-term spaces.

The development of site E, located in the block bounded by Main, Adams, Front and Washington, is recommended for long-term parking. This site is presently in medical facilities use, but plans have been made to relocate this facility. In the Traffic Circulation Plan, the realignment of Washington Street in line with Clay Street is recommended, thus increasing the land area in the block. At full development, this block can accommodate a total of about 233 parking spaces. The need for the 33 customer parking spaces on the site would disappear with the removal of the medical facility.

The long-term parking area labeled F on the plan situated south of Front Street and east of Clay Street, is recommended for development. The site can accommodate about 193 long-term parking spaces.

The long-term parking area labeled G on the plan, situated between Kiwanis, Clay, LeVasseur, and Pattee, is recommended for development. The area can accommodate about 306 spaces.

The long-term parking areas labeled H, I, J, and K on the plan, located south of Front Street on the river bench are recommended for development, supplementing the plans prepared for the development of the riverfront. These plans call for about 450 long-term parking spaces in this vicinity. Currently, much of this area is in long-term parking use. The net gain in the number of long-term parking spaces will be negligible; however, the gains in amenities and circulation facilities will be considerable.

The long-term parking area labeled L on the plan, located between Pine, Woody, Broadway and Orange, is recommended for development. The area at full development can accommodate about 130 spaces, a net gain in long-term parking of about 120 spaces.

The long-term parking area labeled M on the plan, located between Spruce, Woody, Pine and Orange, is recommended for development. The area at full development can accommodate a total of 130 spaces, for a net gain in long-term parking of about 126 spaces.

The long-term parking area labeled N on the plan, located between Spruce, Ryman, Pine and Woody is recommended for development. The area at full development can accommodate a total of about 130 spaces. Currently, the area contains seven long-term spaces.

The estimated 1985 long-term off-street parking needs have been summarized in Table IX-4. At the full development stage, the CBD will be able to provide open long-term parking in fourteen well-located facilities with about 2,110 total spaces. To provide this high level of long-term parking service, the City and the CBD property owners should acquire land and develop parking amounting to about 1,500 long-term off-street spaces.

Some of the areas designated on the plan for long-term parking development may culminate in short-term parking through relocation of major traffic generators such as the post office or the major department stores. Such a change will not critically upset the plan for short and long-term parking. At the new location of the major traffic generator, part of the long-term parking will convert to short-term parking while at the former location, the need for short-term parking will decrease and be absorbed by long-term parking. Considering the entire CBD, the balance between short and long-term parking will be maintained.

Parking Plan Implementation

Implementation of the off-street parking program in the Missoula CBD involves organization, financing for land acquisition and construction, and operating procedures and policies.

Organization. The CBD property owners should form a Parking Association, with membership open to all upon payment of a nominal membership fee. From the membership, a board of directors should be selected to direct the operations of the Association. The mayor and some of the City Council and Planning Board members should be appointed as ex-officio members of the board of directors. By the time the Parking Association is operating a number of parking facilities, a salaried part-time executive secretary may be appointed.

Financing. An off-street parking program may be financed with government resources, private capital or the combination of both. The City government can seek voter approval

TABLE IX - 4

1985 LONG-TERM PARKING NEEDS[a]

Facility	Full Development	Current Supply	Net Increase in Supply
A	130	91	39
B	170	6	164
C	130	45	85
D	110	13	97
E	233	-	233
F	193	-	193
G	306	-	306
H	80	80	-
I	130	130	-
J	110	110	-
K	130	130	-
L	130	9	121
M	130	4	126
N	130	7	123
TOTAL	2,112	625	1,487

[a]Measured in number of parking spaces

Source: Clark, Coleman & Rupeiks, Inc.

of a general obligation bond issue to implement a substantial portion of the CBD off-street parking program. Securing voter approval for such a bond issue is questionable. The residential property owner generally feels that the obligation of providing off-street parking in the CBD rests with the downtown property owners. The City government also has the authority to market off-street parking revenue bonds without requiring voter approval. As a general rule, the marketability of revenue bonds requires that the annual income from parking revenues be one and one half times the annual payment of principal and interest. It is questionable that the off-street parking program in Missoula, containing the development of a larger number of long-term parking facilities, can generate the required revenues. The City can also provide off-street parking with Federal assistance through the urban renewal program.

The 1967 Montana legislature passed House Bill No. 320 allowing cities to form an improvement district and sell improvement bonds to carry out off-street parking programs. The bill was signed into law but its constitutionality has not been tested. This enabling legislation should be seriously considered as the tool for implementation of the off-street parking program in the CBD. The difficulties

associated with the formation of a special improvement district and sale of improvement bonds are many. The primary problem is that a relatively ambitious and full scale program is necessary to provide a number of off-street facilities in key locations at one time.

Often, an agreement between the City and a group of property owners is reached where the private groups acquires the land, pays for the improvements and leases the facility to the City. The City makes lease payments on the principal with a nominal interest over a long period of time. At the end of the lease payment period, the land and improvements revert to the City. Usually, the lease payments can be made out of generated parking revenues. Under this financing scheme, the implementation of the parking program can proceed more quickly and on a more moderate scale.

Naturally, any parking improvement program can be financed by private capital. However, investors either look for high return on their investments or view the investment in parking as a direct benefit to their business in excess of the monies invested. Larger department stores often build parking structures exclusively for their own use, linking the parking structure and the retail building with pedestrian ways.

Once an active off-street parking improvement program in the CBD is underway, it may be desirable to amend the zoning ordinance to include a section requiring provision of off-street parking with every improvement in the CBD. The revision should include a section allowing the property owner to contribute, at a rate of about $1,000 to $1,500 for each additional required parking space, to the parking improvement fund. Once substantial sums have been accumulated, the administrators of the fund will acquire land and finance the construction of additional parking facilities.

There are many ways of financing off-street parking programs. Various alternatives should be explored by members of the business community and the one most appropriate for Missoula should be selected and implemented. The off-street parking improvement program should not become the exclusive responsibility of either the government or the private sector. It should be approached as a coordinated and cooperative effort of the City and the CBD community as partners.

Capital Costs. A conservative estimate is that the short-term off-street parking program will cost the community a total of $1,062,000 in land and improvements. Over a twenty-year period this results in an annual investment of about $53,100. This sum is not excessive when it is considered that the value of a parking space as a retail sales generator is estimated frequently as high as $10,000.

The estimated cost of providing long-term off-street parking facilities in the Missoula CBD amounts to about $1,465,000. Over a twenty-year period, this amount results in an annual investment of about $73,300.

The cost of land and improvements per space is estimated at $1,118 for short-term parking and $694 for long-term parking. These average unit costs reflect savings in already acquired land and in improvements already in place. The actual acquisition costs for short-term parking in structures may run as high as $3,000 per space. The land costs vary considerably by location.

Programming. During the initial five-year period, 1968 through 1972, two projects in the short-term parking program should be carried out. The land area west of lot 6 should be acquired and the current lot be expanded west to Ryman Street. Land area at site C should be purchased and the facility operated as a short-term surface lot.

In the long-term parking development area, parking lots G, H, I, J and K on the river front should be developed during the initial five-year period, 1968 through 1972. Also parking lot E should be developed for all day parking.

The short-term parking developments during the succeeding six-year period, 1973 through 1978, should include development of lot E, construction of a four-level garage at site C, and acquisition of land and expansion of lot A east to Pattee Street.

The entire parking program should be reviewed annually and the schedule of improvements should be adjusted to prevailing and estimated parking demands and the amount of monies at hand or expected to be available. A minimum of a six-year improvements program should always be at hand.

Operating Procedure. All short and long-term parking facilities to be provided in the CBD should be self parking.

The long-term parking facilities should either be free or controlled by ten hour meters.

All short-term parking facilities should be attendant operated to collect parking fees or parking validations.

A CBD area-wide parking validation program should be initiated and carried out. Participation in the validation program should be voluntary on the part of retail and business outlets.

CHAPTER 10

CHAPTER X RECOMMENDED IMPROVEMENTS

Implementation of the recommended transportation plan requires a number of physical improvements in the street and highway system. This chapter discusses street design standards, specific improvements, and the estimated cost of recommended improvements. Financing and programming of the recommended improvements will be discussed in Chapter XI.

STREET DESIGN STANDARDS

In the improvement of existing streets and in the development of facilities, the principal elements of roadway design should be standardized for each type of facility to ensure efficient operation and maximum safety. Design standards consistent with established policies provide safety features and conform to traffic-carrying capacity requirements.

Streets and highways in the Missoula area vary greatly in roadway design and right-of-way widths, often causing traffic congestion. The deteriorated condition of pavements, curbs and sidewalks also contribute to poor traffic operation and pedestrian conflicts.

Design standards for each type of street or highway facility, recommended in the transportation plan, have been developed in conformity with policies of the Montana Highway Commission, the Bureau of Public Roads, and the engineering departments of the City and County of Missoula. Recommendations for the principal design elements of primary and secondary arterials, collector streets and local access streets are shown in Table X-1. Design elements of the freeway have not been shown in the table because a need for additional freeway construction is not anticipated within the twenty-year plan period. However, some of the basic design elements of the freeway should be mentioned.

A basic requirement of a freeway is that access be limited to interchanges designed to permit vehicles to enter and leave with a minimum of conflict in movement and interruption of through movement. Another basic feature is that all intersecting railroads and cross streets will be separated at grade to allow uninterrupted through traffic flow on the freeway. All freeways are divided highways with opposing flows separated by a median strip varying in width from a guard rail barrier to 100 feet or more. Medians

TABLE X - 1

STREET DESIGN STANDARDS

Design Element	Primary Arterials	Secondary Arterials	Collectors	Local Access
Traffic Service Volume	11,000-26,000[a]	8,000-15,000[a]	4,000-9,000[a]	Under 1,000[a]
Right-of-way Width	100-120 feet	80 feet	60 feet	60 feet
Pavement Width	60-82 feet	46-54 feet	37-42 feet	37-42 feet
Design Speed	50 mph	40 mph	35 mph	30 mph
Number of Travel Lanes	4 - 6	4	2 - 4	2 - 4
Minimum Travel Lane Width	12 feet	11 feet	10 feet	10 feet
Median Width	18-22 feet	0-8 feet		
Sidewalks	Both sides	Both sides	Both sides	Both sides
Maximum Degree Curvature	5 - 8	8 - 12	12 - 25	25
Maximum Grade	6 percent	7 percent	8 percent[b]	8 percent[b]
Illumination	Intersections	Intersections		
Structure Width	Pave. width + 4'[c]	Pave. width + 4'[c]	Pave. width + 4'[c]	Pave. width + 4'[c]
Structure Loading	H20 to S16	H20 to S16	H20 to S16	H10 to H20-S16
Vertical Clearance	17 feet	17 feet	15 feet	15 feet
Railroad Crossing Design	Grade separated	Signal gate	Flashing lights	Flashing lights

[a]Average Daily Traffic (ADT)

[b]Under special conditions, steeper gradients may be permitted

[c]Plus sidewalks

Source: Clark, Coleman & Rupeiks, Inc.

minimize the hazards of head-on collisions and eliminate U-turns. Paved shoulders vary from four feet on the median side to ten feet on the right of traffic. Shoulders provide for emergency parking of disabled vehicles and for the maintenance and protection of the main roadway pavement edges. Freeways have a minimum of two travel lanes in each direction, the lane width being 12 feet. Roadway grades are limited to about five or six percent, allowing travel speeds of up to 70 miles per hour. Right-of-way adequate for desirable roadway design ranges from 150 feet upwards, depending upon median width, number of travel lanes and terrain.

STANDARD ROADWAY CROSS SECTIONS

The recommended standard cross sections for use on the arterial, collector and local access streets are shown in Figure 35. Because urban characteristics are expected to prevail in areas where the majority of improvements will be needed, most of the typical sections include curb and gutter.

One of the principal considerations in improving existing arterial streets and in planning new facilities in developed areas is the problem of constructing a satisfactory roadway within the limits of available right-of-way. Often, a compromise between the desirable design and the limited right-of-way width is necessary. The width of border areas may have to be reduced and parking lanes eliminated. A number of compromise cross sections within a limited right-of-way are shown in Figure 35.

Primary Arterials. Primary arterial design is characterized by inclusion of median dividers. Medians effectively delineate opposing traffic, facilitate turning movements at intersections and eliminate cross traffic at minor cross streets. They provide a safety zone for pedestrians and are often suitable locations for installation of traffic control devices.

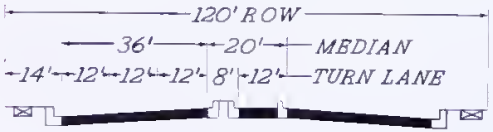
A four lane median-divided roadway can be constructed within a 100 foot right-of-way, but if curb parking is provided, the right-of-way requirement increases to 110 feet. Within a 120 foot right-of-way a six lane median-divided roadway can be constructed. Curb parking would not be permitted. Travel lanes should be 12 feet wide and the border 14 feet wide.

Street widening and improvements must often be made within the existing right-of-way which, in the case of

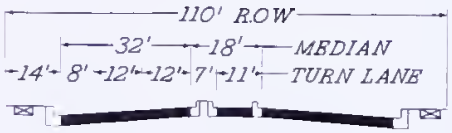
STREET DESIGN STANDARDS

Primary Arterial Streets

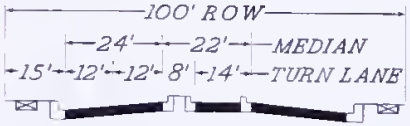
New Construction in Future R.O.W. or Reconstruction Within Available R.O.W.



SIX LANES, DIVIDED WITH NO PARKING

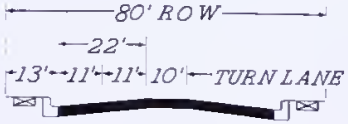


POUR LANES, DIVIDED WITH PARKING

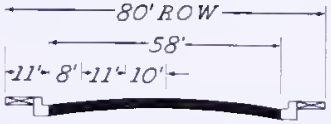


POUR LANES, DIVIDED WITH NO PARKING

Reconstruction Within Limited R.O.W.



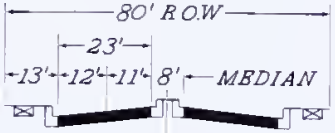
POUR LANES WITH PAINTED TURN LANE AT INTERSECTION WITH NO PARKING



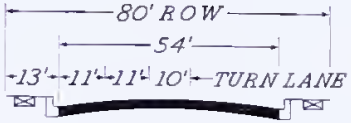
POUR LANES WITH PARKING

Secondary Arterial Streets

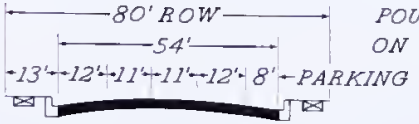
New Construction in Future R.O.W. or Reconstruction Within Available R.O.W.



FOUR LANES, DIVIDED WITH NO PARKING

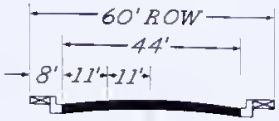


FOUR LANES WITH PAINTED TURN LANE AT INTERSECTION WITH NO PARKING



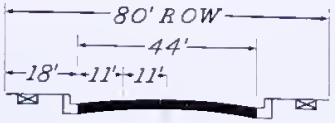
POUR LANES WITH PARKING ON ONE SIDE

Reconstruction Within Limited R.O.W.



POUR LANES WITH NO PARKING OR TWO LANES WITH PARKING OR POUR LANES WITH RESTRICTED PARKING AT PEAK HOURS

Stage Construction

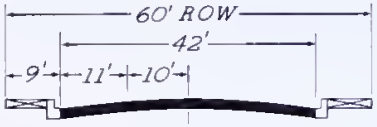


POUR LANES WITH NO PARKING OR TWO LANES WITH PARKING OR POUR LANES WITH RESTRICTED PARKING AT PEAK HOURS

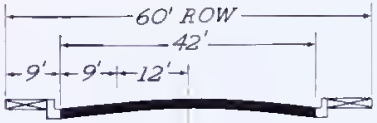
FIGURE 35

Collector Streets

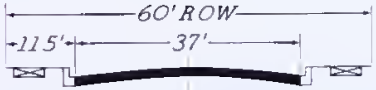
New Construction in Future R.O.W. or Reconstruction Within Available R.O.W.



COMMERCIAL· FOUR LANES WITH NO PARKING

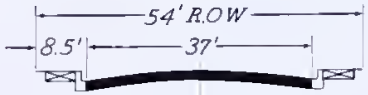


COMMERCIAL-INDUSTRIAL TWO LANES WITH PARKING



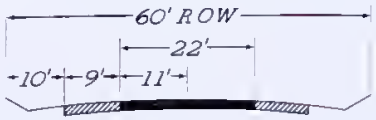
RESIDENTIAL TWO LANES WITH PARKING

Reconstruction Within Limited R.O.W.



RESIDENTIAL TWO LANES WITH PARKING

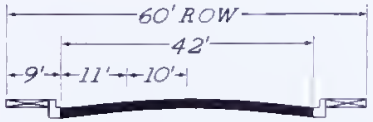
Stage Construction in Rural Areas



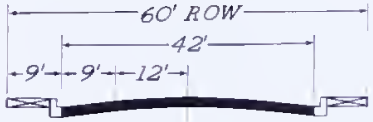
RESIDENTIAL TWO LANES WITH GRAVEL SHOULDERS

Local Access Streets

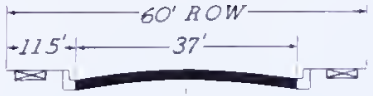
New Construction in Future R.O.W or Reconstruction Within Available R.O.W.



COMMERCIAL. POUR LANES WITH NO PARKING

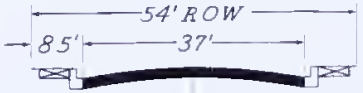


COMMERCIAL-INDUSTRIAL TWO LANES WITH PARKING

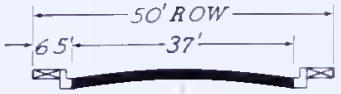


RESIDENTIAL TWO LANES WITH PARKING

Reconstruction Within Limited ROW

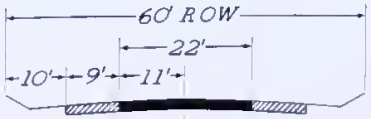


RESIDENTIAL TWO LANES WITH PARKING



RESIDENTIAL TWO LANES WITH PARKING

Stage Construction in Rural Areas



RESIDENTIAL TWO LANES WITH GRAVEL SHOULDERS

primary arterials is normally not less than 80 feet. A minimum right-of-way of 80 feet will permit the expansion of the existing facility to four travel lanes with a turning lane or to four narrow travel lanes with two curb parking lanes.

Secondary Arterials. Secondary arterials are characterized by narrower right-of-way and travel lanes. An 80 foot right-of-way can accommodate either four travel lanes with a six-foot median, four travel lanes with a turning lane or four travel lanes with one parking lane. Travel lane widths vary from 11 to 12 feet and the border area is 13 feet.

Reconstruction within limited right-of-way, usually 60 feet, allows four eleven-foot travel lanes and an eight foot border area. When traffic volumes permit, curb parking on both sides may be allowed. In new construction in rural areas, an 80 foot right-of-way should be preserved even though only two travel lanes with gravel shoulders are initially necessary.

Collector Streets. In the design of collector streets, distinction should be made between commercial, industrial and residential collectors. Generally, all collector streets should be accommodated within a 60 foot right-of-way.

Collector streets in commercial areas often require four travel lanes to handle peak travel loads. At other times curb parking is permitted. This condition requires a 42 foot pavement section.

Collector streets in industrial areas often require wider travel lanes and curb parking. Two twelve-foot travel lanes and two nine-foot parking lanes can be accommodated within a 42 foot pavement.

The requirements for residential collector streets are somewhat less. A pavement width of 37 feet is necessary to carry two travel lanes and permit curb parking on both sides of the street.

In the reconstruction of collector streets within a limited right-of-way, the pavement width should not be below 37 feet. The border areas can be reduced to 8.5 feet in a right-of-way of 54 feet.

Local Access Streets. The design cross section of a local street, whether in a commercial, industrial or residential area, is the same as that of a collector street. The difference lies in traffic control. All collector streets

should be center striped and all cross streets to the collector should be stop sign controlled.

All new local access streets, regardless of location or stage of development, should have a minimum of 60 feet right-of-way. When local access streets are improved within a limited existing right-of-way, the pavement should be constructed to a width of 37 feet.

STANDARD ROADWAY CAPACITIES

The traffic carrying capacity for an urban freeway and for each recommended cross section design is shown in Table X-2.

Traffic carrying capacities have not been shown for residential streets where the function is land access rather than traffic service. Anytime the average weekday volume exceeds 1,000 vehicles, the area should be investigated to determine the cause of the heavy loading and corrective measures applied to direct through travel to arterials or collector streets.

The recommended arterial or collector street improvements will conform to one of the standard cross section designs. The selection of a specific cross section design depends largely upon its ability to satisfy the estimated 1985 traffic demand.

RECOMMENDED IMPROVEMENTS

Substantial improvements to the arterial and collector street system in Missoula are required over a period of 20 years to meet forecasted 1985 travel needs. The improvements have been classified into four general categories: operational improvements on the existing roadway, roadway widening within the existing right-of-way, roadway widening requiring acquisition of additional right-of-way and new construction. Figure 36 shows the recommended improvements of the transportation plan.

The majority of the improvements are on the arterial and collector street system. Minor improvements on Interstate Highway 90 and on the local access street system are also recommended. The following sections describe the recommended improvements.

TABLE X - 2

STANDARD ROADWAY CAPACITIES

	Vehicle/Hour Green[a]	24-Hour Capacity[a]
Freeway		
Four lane urban section	4,600-5,000	38,000-42,000
Primary Arterial		
Six lanes divided, no parking	4,100-5,200	20,000-26,000
Four lanes divided with parking	2,900-3,500	14,800-18,000
Four lanes divided, no parking	3,000-3,700	15,000-19,000
Four lanes, turn lane, no parking	2,500-3,200	13,000-16,000
Four lanes with parking	2,200-2,800	11,000-14,000
Secondary Arterial		
Four lanes divided, no parking	2,700-3,300	12,000-15,000
Four lanes, turn lane, no parking	2,500-3,200	12,000-15,000
Four lanes, parking one side	2,400-3,000	11,000-14,000
Four lanes, no parking	2,400-3,000	11,000-14,000
Two lanes with parking	1,800-2,200	8,000-10,000
Collector Street		
Four lanes, no parking	2,400-2,900	7,000- 9,000
Two lanes with parking	1,600-2,000	5,000- 6,000
Two lanes with parking, residential	1,300-1,800	4,000- 5,000

[a]The capacities are based on the following: PHF = .80; LF = 0.3; peak hour = .12 AWD; left turns, 10 percent; right turns, 10 percent; comm. vehicles, 5 percent; local transit - none; green time, primary arterial 60 percent; secondary arterial, 55 percent; collector street, 35 percent; directional split 55-45 percent

Sources: Clark, Coleman & Rupeiks, Inc.; Highway Capacity Manual

RECOMMENDED
LONG RANGE STREET AND HIGHWAY IMPROVEMENTS

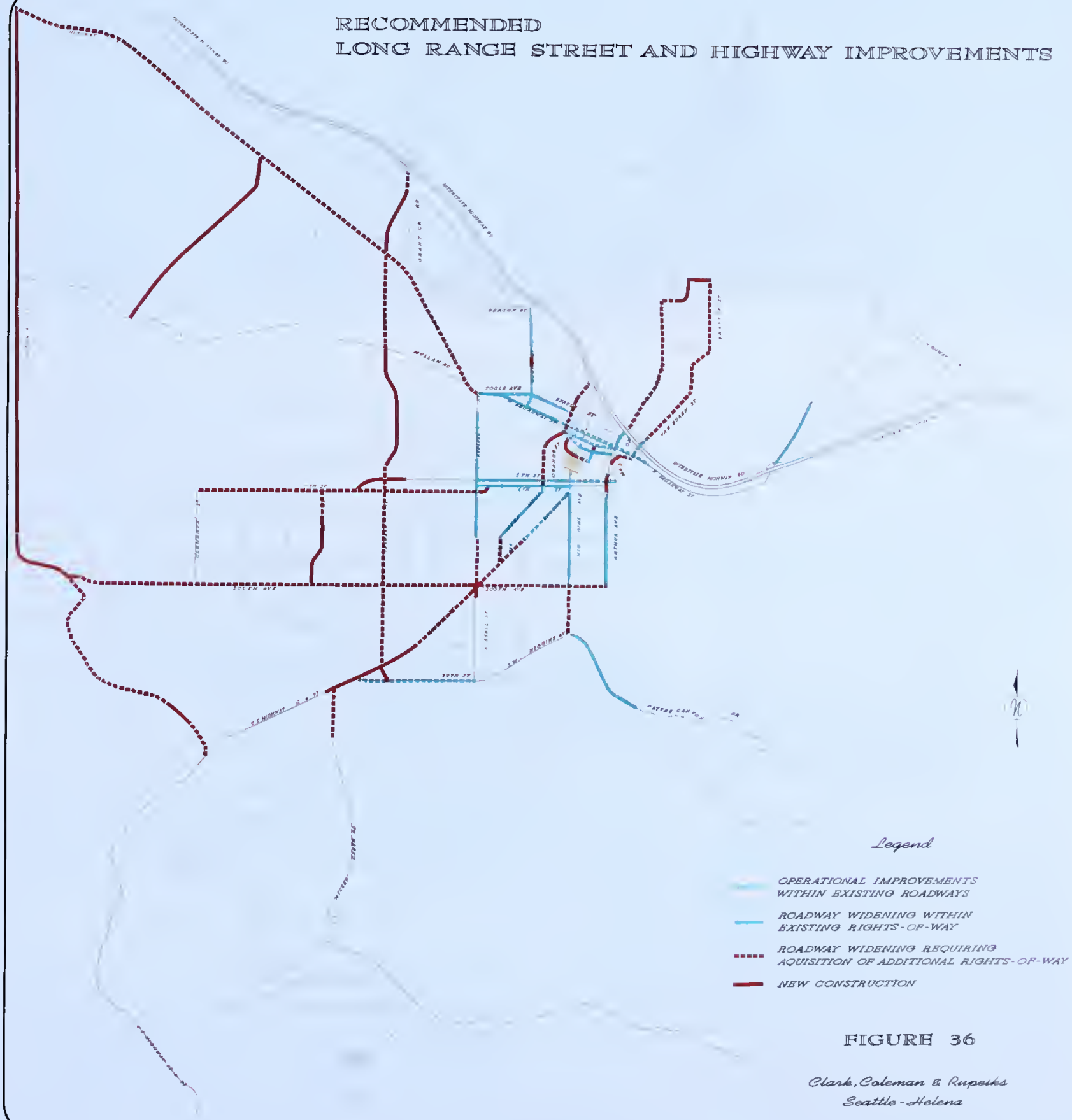


FIGURE 36

Clark, Coleman & Rupeiks
Seattle - Helena

Interstate Highway

Interstate Highway 90, passing through Missoula, will have a structural life of from 30 to 40 years. Functionally, the Interstate Highway will be adequate for at least the 20 year plan period. Functional obsolescence may occur thereafter depending entirely on the rate of technological and sociological change in our society.

The estimated 1985 traffic volumes at the VanBuren Street interchange are high for a conventional diamond interchange. Under present operating conditions, traffic volumes at the 1985 level exiting from the east may back up onto the travel way.

Traffic signal control is recommended at the ramp terminals at VanBuren Street. Traffic signals should be responsive to volume demands and should be coordinated with signal installation at the intersection of VanBuren Street and Broadway. Minor channelization improvements should be carried out at the time of signal system installation. These improvements are estimated to cost about $18,000.

Primary and Secondary Arterials

The recommended improvements on the primary and secondary arterial system range from installation of minor traffic control devices to major construction and new construction including major structures.

The recommended improvements to the primary and secondary arterial street system will be discussed in the following sections and presented in Tables X-3 and X-4. In more complex areas conceptual design proposals have been illustrated. The recommended and illustrated improvements should not be considered fixed. Considerable preliminary engineering design studies should be carried out prior to actual construction. However, these recommendations do provide a guide for overall system development.

Collector and Local Access Streets

The recommended transportation plan includes a substantial network of collector streets, particularly in the outlying areas. The construction of these collectors depends entirely upon the location and intensity of development. Therefore, the construction and right-of-way costs and

TABLE X-3

RECOMMENDED IMPROVEMENTS - PRIMARY ARTERIALS

Route Description	Existing Conditions	Recommended Improvements
RESERVE STREET		
1. Beginning at the Grant Creek interchange with the Interstate Highway 90, the route proceeds in a southerly direction crossing the Northern Pacific Railroad tracks and U. S. Highway 10 and 93, West Broadway. Distance - 0.99 miles.	The land in the proposed right-of-way is vacant or in agricultural use.	The right-of-way varies from 150 to 270 feet. The roadway section consists of two twelve-foot travel lanes with eight-foot paved shoulders. The route crosses the Northern Pacific Railroad tracks and U. S. Highway 10 and 93, West Broadway, via a structure 30 feet in width. Access along this section of the route should be limited to two cross streets.
2. From U. S. Highway 10 and 93, West Broadway, south along the section line road commonly known as the Sugarbeet Lane to an intersection with Mullan Road. Distance - 0.95 miles.	The right-of-way required for the interchange consumes a substantial portion of an apple orchard, a residence and a number of miscellaneous structures. The existing right-of-way along Sugarbeet Lane amounts to about 45 to 50 feet. The roadway itself is about 20 feet wide with a pavement surface.	The route connects to U. S. Highway 10 and 93, West Broadway, via a partial clover leaf interchange constructed on the south side of the structure. The right-of-way required at the interchange extends about 400 feet to both sides of the route. The right-of-way between U. S. Highway 10 and 93 and Mullan Road varies from 150 to 180 feet. The roadway section consists of two twelve-foot travel lanes with eight-foot paved shoulders. Full control of access should be extended south about 2,400 feet to the section line.
3. From Mullan Road south, crossing the Clark Fork River, then along the section line, crossing the Chicago, Milwaukee, St. Paul and Pacific Railroad, to South 3rd Street. Distance - 1.27 miles.	South of Mullan Road, the route crosses the road to the sewage treatment plant. South of the river, the right-of-way requirements consume a number of residences.	South of Mullan Road, a two twelve-foot travel land roadway with eight foot paved shoulders should be constructed in a minimum of 150-foot right-of-way. The bridge over the Clark Fork River should be constructed 30 feet in width. South of the bridge the route should be continued with two twelve-foot travel lanes and with eight-foot paved shoulders. The route should cross over the Chicago, Milwaukee, St. Paul and Pacific Railroad tracks on a 30-foot wide structure. Access should be restricted along this route between Mullan Road and South 3rd Street. The road to the City dump should be rerouted to Mullan Road. Unless full control of access is established along this section of the route, a four-lane structure crossing the river and the railroad will be required.

Route Description	Existing Conditions	Recommended Improvements
4. From South 3rd Street south along Reserve Street to South Avenue. Distance - 1.25 miles.	The existing right-of-way along Reserve Street between South 3rd and South Avenue amounts to 60 feet. The road surface is 24 feet wide and in good condition.	Acquisition of any additional right-of-way requires acquisition of a number of residential structures. It is recommended that a 100-foot right-of-way be acquired through this section. A four lane divided roadway section with no parking should be constructed.
5. From South Avenue south along Reserve Street to the new alignment of U. S. Highway 12 and 93, South Brooks Street. Distance - 0.71 miles.	The existing right-of-way along Reserve Street between South Avenue and U. S. Highway 12 and 93 amounts to 60 feet. The road surface is 20 feet wide and in good condition. Fort Missoula flanks this section of roadway to the west.	An additional 40 feet of right-of-way should be acquired on the west side to make the total right-of-way width 100 feet. A four-lane divided roadway section with no parking should be constructed. Traffic signal control and minor channelization will be required at the intersection with U. S. Highway 12 and 93.
6. From new alignment of U. S. Highway 12 and 93 south to 39th Street at the intersection of 24th Avenue. Distance - 0.28 miles.	The land along this section is presently underdeveloped.	It is recommended that a 100-foot right-of-way be acquired for this section to provide for the construction of a two-lane roadway with room to widen to four lanes to meet future needs.
RUSSELL STREET		
1. Beginning at the intersection with U. S. Highway 10 and 93 proceeding south to the intersection with South 3rd Street. Distance - 0.75 miles.	The existing right-of-way width varies throughout this entire section. North of the Clark Fork River the right-of-way amounts to 70 feet. South of the river to Idaho Street, the right-of-way amounts to 100 feet. South of Idaho to Dakota Street the right-of-way width amounts to 95 feet. Between Dakota and South 3rd Street, the right-of-way varies from 87 feet to 140 feet and as high as 163 feet. The roadway width north of the Clark Fork River amounts to 28 feet, 24 feet on the structure and to 32 feet to Wyoming Street. Russell Street crosses under the Chicago, Milwaukee, St. Paul and Pacific Railroad tracks in a 24-foot-wide roadway. South of the railroad underpass to South 3rd Street the roadway is 34 feet wide. The paving is in good condition.	Thirty feet of additional right-of-way should be acquired north between the Clark Fork River and U. S. Highway 10 and 93 to reserve space for eventual construction of a parallel bridge or reconstruction of the existing bridge to provide four travel lanes. Access to Russell Street, north of the river bridge to U. S. Highway 10 and 93, and south to Idaho Street should be controlled to preserve the traffic carrying capacity of the structure. The roadway south between the river bridge and South 3rd Street, with the exception of the railroad undercrossing, should be widened to allow four median-separated travel lanes and no curb parking. Adequate provisions should be made to preserve the traffic carrying capacity of the railroad undercrossing structure. Eventually a parallel undercrossing may have to be constructed.
2. From South 3rd Street south along Russell Street to the intersection with South Avenue and Brooks Street. Distance - 1.25 miles.	Between South 3rd Street and 7th Street, the right-of-way width amounts to 94 feet. South of 7th Street the right-of-way narrows to 87, 83 and down to 73 feet in specific areas. Pavement width varies from 24 feet between 3rd and Mount to 32 feet between Kensington and North to 40 feet between North and South Avenues.	An additional seven feet of right-of-way should be acquired along Russell Street between Mount and South Avenues. A roadway section should be constructed consisting of four eleven-foot travel lanes, a ten-foot median and turn lanes at intersections. Traffic control signals should be installed at intersections with South 3rd, South 5th, South 6th and South 7th Streets. The treatment of the intersection design of Russell Street with South Avenue and Brooks Street will be discussed in detail under Brooks Street and is shown in Figure 38.

Route Description	Existing Conditions	Recommended Improvements
3. From South Avenue along Russell Street to the intersection with 39th Street. Distance - 1.00 miles.	The route parallels the western edge of the County fairgrounds, the little league baseball park and Russell School. The roadway is 40 feet wide within a right-of-way of 80 feet.	No major improvement is recommended for this section of the route with the exception of the intersection treatment with South Avenue and Brooks Street. Proper setback of buildings should be established along this route to allow for eventual acquisition of right-of-way to 100 feet.
ORANGE STREET		
1. Beginning at the interchange with Interstate Highway 90 proceeding south along Orange Street to the intersection with Broadway. Distance - 0.55 miles.	This section of Orange Street crosses under the Northern Pacific Railroad tracks in a structure having a roadway width of about 28 feet. The pavement width south of the railroad undercrossing amounts to 47 feet. Right-of-way through this section varies in width from 63 to 80 feet. Curb parking is currently allowed along both sides of Orange Street with the exception of the section through the underpass.	North of the railroad crossing, 34 feet of additional right-of-way should be acquired on the west side. A 36-foot easement under the railroad tracks should be acquired and a parallel undercrossing constructed west of the existing structure. South of the undercrossing structure, varying widths of right-of-way on each side of Orange Street should be acquired to establish a 100-foot right-of-way. A four land roadway section with median separation and no curb parking should be constructed. Traffic signals should be installed at Spruce and Pine Streets.
2. From the intersection with Broadway along Orange Street to the intersection with Stephens Avenue. Distance - 0.82 miles.	This section of Orange Street crosses the Clark Fork River and the Chicago, Milwaukee, St. Paul and Pacific Railroad tracks on a structure with a roadway width of 30 feet. The roadway width between Broadway and the north approach to the river bridge amounts to about 65 feet. South of the bridge to Stephens Avenue, the roadway is about 40 feet wide. Right-of-way through this section of the road is about 80 feet wide.	Between Broadway and the north approach to the river bridge 20 feet of additional right-of-way should be acquired on the west side. A median divided four-lane roadway section with no parking should be constructed. Intersections with Broadway and with Front and Main Streets should be channelized as shown in Figure 42. A parallel bridge structure should be constructed to the east of the present structure. This requires acquisition of 50 feet of additional right-of-way on the east side. Northbound traffic should be routed onto the eastern span and southbound traffic onto the western span, the existing structure. South of the bridge, along Orange Street, 20 feet of additional right-of-way should be acquired on the east side. A four-lane median divided roadway with no parking should be constructed. The recommended roadway design elements for parts of this section are shown in Figure 37.
3. From the intersection with Stephens Avenue and Orange Street along Stephens Avenue to the intersection with Middlesex Street and Mount Avenue. Distance - 0.68 miles.	Along Stephens Avenue, the right-of-way amounts to 124 feet and the curb to curb roadway width to 92 feet. The existing pavement is in need of repair or resurfacing.	A median-divided roadway section with three travel lanes in each direction should be constructed, with curb parking allowed during off-peak periods. A traffic signal should be installed at the intersection with Crosby Street to allow safe crossing of school children and some local traffic. The recommended roadway design elements for parts of this section, including channelization treatment at the intersection with Mount, Knowles and Middlesex, are shown in Figure 37.

Route Description	Existing Conditions	Recommended Improvements
4. From the intersection with Stephens, Middlesex and Mount, along Middlesex Street to the intersection with Brooks Street. Distance - 0.26 miles.	The roadway is newly constructed, 50 feet wide within 60 foot right-of-way.	Forty feet of additional right-of-way should be acquired and a median-divided four-lane roadway section with no curb parking construction. Channelization improvements at the intersection with Brooks Street should be installed as shown in Figure 37.
BROOKS STREET		
1. From the intersection of Brooks and Middlesex along Brooks Street to the intersection with Russell Street and South Avenue. Distance - 0.36 miles.	This section of the route contains four travel lanes within a 44-foot roadway. The right-of-way amounts to 60 feet.	An additional 40 feet of right-of-way should be acquired and a median-divided four-lane roadway section with no parking construction. In the median section between Kent and Central, a two-way left turn lane should be installed. The intersection of Brooks, South and Russell should be improved as shown in Figure 38. The opposing lanes of travel should be separated, a master controlled system of traffic signals installed, the intersection illuminated and directional signing installed.
- From the intersection of Brooks, South and Russell along Brooks Street to the crossing of the Bitterroot River. Distance - 2.12 miles.	The existing right-of-way along this section amounts to 60 feet. The roadway width between the intersection with South and Russell to the intersection with Minneapolis amounts to 40 feet. The roadway section south of Minneapolis amounts to 24 to 26 feet.	Between the intersection of Brooks-South-Russell and the intersection of McDonald, a minimum of 40 feet of additional right-of-way and between McDonald and the Miller Creek Road a minimum of 100 feet of right-of-way should be acquired. Along this section, a median-divided four-lane roadway with no parking should be constructed. A traffic signal should be installed at the intersection with Reserve Street.
3. From the Bitterroot River crossing along U. S. Highway 12 and 93 to the south line of the Study Area. Distance - 3.60 miles.	In the fall of 1965, during the basic data-gathering phases, this section of the roadway consisted of two travel lanes, 25 feet wide with narrow shoulders. The right-of-way amounted to 60 feet.	During the years 1966 and 1967, this section of the roadway has been reconstructed. A parallel structure over the Bitterroot River has been constructed and the roadway has been widened to provide four travel lanes. The reconstructed section of the roadway meets estimated 1985 travel needs.
HIGGINS AVENUE		
1. Starting in the Central Business District at the intersection of Broadway and Higgins, along Higgins Avenue south across the Clark Fork River to the intersection with Brooks Street. Distance - 0.64 miles.	The section of Higgins Avenue between Broadway and Front Streets contains four travel lanes and two parking lanes. The curb to curb width amounts to 66 feet and the right-of-way is 99 feet wide. The Higgins Avenue bridge contains four travel lanes. South of the bridge the pavement narrows to 55 feet and the right-of-way to 80 feet.	In the Central Business District between Broadway and Front Street, curb parking on the east side of the street should be eliminated and left turn storage lanes at Broadway, Main and Front Streets installed. The details of this recommendation are shown in Figure 42. South of the Higgins Avenue Bridge, curb parking should be removed and four travel lanes installed with turn lanes at intersections within the existing curb to curb width. At the intersection with Brooks Street, channelization should be installed as shown in Figure 39.

Route Description	Existing Conditions	Recommended Improvements
2. From the intersection with Brooks Street, south along Higgins Avenue to the intersection with South Avenue. Distance - 0.95 miles.	This section of Higgins Avenue contains two travel lanes and two parking lanes. The existing curb to curb width varies from 45 to 50 feet and the right-of-way width is 80 feet.	Within the existing right-of-way, the pavement should be widened to accommodate four traffic lanes, turn lanes at major intersections and no curb parking. The stub [illegible] on Higgins at Strand should be removed and the local access street intersections with Higgins Avenue on the west side should be eliminated, as shown in Figure 39. A traffic signal should be installed at the intersection with Evans Avenue as well as channelization and a system of traffic signals at the intersection with South Avenue, as shown in Figure 39.
3. From the intersection with South Avenue, south along Higgins Avenue to the intersection with Pattee Canyon Drive. Distance - 0.51 miles.	The right-of-way in this section is 80 feet. The pavement width varies from 37 to 40 feet.	An additional 20 feet of right-of-way on the east side of Higgins Avenue should be acquired and a median divided four-lane roadway section with no curb parking constructed. Median openings at selected cross streets are allowed. A traffic signal should be installed at the intersection with Pattee Canyon Drive.
4. From the intersection of Higgins Avenue and Pattee Canyon Drive, southwest along S. W. Higgins Avenue to the intersection with Russell Street. Distance - 1.12 miles.	The right-of-way in this section is 80 feet wide and the roadway width is 30 feet.	This section of the roadway appears to be adequate to serve estimated 1985 travel needs. However, provisions should be made to establish setback lines for eventual acquisition of right-of-way to a total of 100 feet.
5. From the intersection of S. W. Higgins Avenue and Russell Street, west along 39th Street to the intersection with the new alignment of Brooks Street or U. S. Highway 93. Distance - 1.47 miles.	The right-of-way width is 80 feet between Russell and Paxon Streets and 60 feet between Paxon and Brooks. The roadway width is 25 feet.	New development along this section should be set back to allow eventual acquisition of right-of-way to amount to a total of 100 feet. Left turn storage lanes should be installed at the intersections with Russell Street, Paxon Street, Dove Lane and Gharrett Street. This roadway section, if maintained in good condition, will adequately serve estimated 1985 traffic needs.
VANBUREN-MADISON-ARTHUR		
1. Starting at the interchange of VanBuren Street and Interstate Highway 90 south along VanBuren Street to Front Street, then westerly along Front Street to the intersection with Madison Street. Distance - 0.34 miles.	VanBuren Street between Interstate Highway 90 and Broadway has a right-of-way of 80 feet and a curb to curb width of 72 feet. Front Street between VanBuren and Madison Street has a right-of-way of 60 feet and a pavement width of 30 feet. Front Street crosses the Rattlesnake Creek on a narrow two-lane concrete bridge.	The recommended improvements along this section of the route are shown in Figure 40. Additional right-of-way should be acquired along Front Street to permit construction of a median divided four-lane roadway section with no parking. A structure crossing the Rattlesnake Creek should be constructed. Median openings should be provided on both sides of Rattlesnake Creek south of Front Street. A free-flowing ramp on a structure should be constructed to facilitate travel from Front Street southbound onto the Madison Street bridge.

Route Description	Existing Conditions	Recommended Improvements
2. Starting from the intersection of Broadway and Madison Street, south along Madison Street, crossing the Clark Fork River, to beginning of Arthur Avenue. Distance - 0.40 miles.	The route crosses the Clark Fork River and the Chicago, Milwaukee, St. Paul and Pacific Railroad on a structure having a roadway width of 56 feet. The roadway width of the north approach to the structure is 70 to 75 feet within a right-of-way of 80 feet. The southern approach to the structure consists of a one-way ramp 30 feet in width.	The recommended design of the north approach to Madison Street bridge is shown in Figure 40. The existing right-of-way should be adequate to accommodate the four travel lanes and turn lanes in the median section. Front Street should be extended easterly across Madison Street with the flow controlled by a traffic signal. South of the Madison Street Bridge, the roadway to Arthur Avenue should be built on a structure crossing over 5th and 6th Streets. The recommended traffic flow and channelization details are shown in Figure 41.
3. From point of intersection of Arthur Avenue and Madison Street Bridge approach, south along Arthur Avenue to South Avenue. Distance - 1.66 miles.	Arthur Avenue has a roadway width of 40 feet. The right-of-way width is 80 feet. Traffic signal control exists at the intersection of University and Arthur Avenue.	Within the existing right-of-way, the roadway should be widened to allow four travel lanes and turn lanes at intersections. Curb parking should be eliminated along the entire section. Traffic signals should be installed with cross streets connecting with the University of Montana parking lots. A traffic signal should be installed on Arthur Avenue at the intersection with Kent Street. Additional right-of-way should be acquired in the northwest quadrant of the intersection of Arthur and South Avenues, and channelization installed as shown in Figure 41.
BROADWAY, U. S. HIGHWAY 10, 12, 93		
1. Beginning at the westerly boundary of the Study Area, along U. S. Highway 10 and 93 to the intersection with Reserve Street. Distance - 3.14 miles.	The highway carries two travel lanes and well maintained shoulders. The right-of-way is about 80 feet.	Industrial and commercial development along U. S. Highway 10 and 93 and the airport necessitate the widening of this section of the road to facilitate four travel lanes. Opposing lanes should be median separated. Twenty feet of additional right-of-way should be acquired.
2. From the intersection with Reserve Street southeast along U. S. Highway 10 and 93 to the intersection with Russell Street. Distance - 1.75 miles.	The roadway continues as a two-lane facility in a right-of-way of 80 feet. Median separation and channelization have been provided at the intersection with Russell Street.	This section of U. S. Highway 10 and 93 has been programmed for improvement by the Montana Highway Commission. A minimum design of four travel lanes, separated by a median, should be provided.
3. From the intersection with Russell Street east along Toole Avenue and West Broadway to the intersection with Orange Street. Distance - 1.02 miles.	The right-of-way along Toole Avenue between Russell and Cowper is 113 feet and from Cowper to Orange along West Broadway, 100 feet. The pavement width varies from 30 feet between Russell and the Bitterroot Branch of the NP Railroad to 44 feet between the tracks and Front Street to 50 feet between Front and Orange.	The intersection with Russell Street is already channelized and signal controlled. A median divided four-lane roadway section should be constructed east to Orange Street. Median openings should be allowed at major cross streets.

Route Description	Existing Conditions	Recommended Improvements
4. From the intersection with Orange Street, east along Broadway to the intersection with Van8uren Street. Distance - 0.80 miles.	This section of the road passes through the Central Business District. The right-of-way throughout this section amounts to 100 feet. The pavement width ranges from 50 feet between Orange and Woody to 66 feet between Woody and Madison to 70 feet east of Madison to VanBuren Street. Curb parking is allowed on both sides. Major intersections are signal controlled.	The section of Broadway between Orange and Woody should be widened to 66 feet. Curb parking on the north side of 8roadway should be eliminated. Left turn storage lanes should be provided at all intersections and additional traffic signals installed at Woody and Washington Streets. The design details on this section of Broadway are shown in Figure 42.
5. From the intersection with Van8uren Street, east along East 8roadway to the interchange with Interstate Highway 90 in East Missoula. Distance - 1.80 miles.	The right-of-way is 100 feet wide for a distance of about 400 feet east of Van8uren; then narrows to 80 feet for the remainder of the section. The pavement width in the 100-foot right-of-way amounts to 70 feet narrowing to 26 feet further east. The route passes underneath the Northern Pacific Railraod tracks south of the interchange with Interstate Highway 90.	This section of the road appears able to serve estimated 1985 traffic needs. Installation of channelization and median separation has been programmed by the Montana Highway Commission for a short distance east of VanBuren Street.
SOUTH 5th STREET		
1. Beginning at the intersection with Maurice Street, proceeding westerly along South 5th Street to the intersection with Orange Street. Distance - 0.68 miles.	Right-of-way along this section of South 5th Street amounts to 80 feet. The pavement width varies from 44 feet between Maurice and Higgins to 40 feet west of Higgins to Orange Street. In 1965, the section between Maurice and Higgins was operated as one-way. Later, in 1966, the one-way operation was extended to Orange Street.	The section between Maurice and Higgins Avenue appears adequate for estimated 1985 traffic loads. Along the 40 foot pavement section between Higgins and Orange, curb parking on the north side should be eliminated to allow two moving lanes and one parking lane. The recommended design details along this route are shown in various illustrations such as Figures 37, 39 and 41.
2. From the intersection with Orange Street, west along South 5th Street to Reserve Street and a short distance to the west joining South 7th Street. Distance - 1.77 miles.	West of Orange Street, the right-of-way along South 5th Street amounts to 60 feet. South 5th Street terminates at the intersection with Eaton Street. The pavement width is 40 feet. Early in 1967, the one-way operation along South 5th Street was extended to Russell Street.	Sixty feet of right-of-way should be acquired west of Eaton Street, crossing Reserve Street, curving south and joining South 7th Street in the vicinity of 27th Avenue. In this section a forty-foot roadway should be constructed with parking allowed on the south side only. 8etween Orange Street and Eaton Street, curb parking on the north side should be eliminated. The entire section should be operated as one-way street westbound.
SOUTH 6th STREET		
1. 8eginning at the intersection with Maurice Street, proceeding westerly along South 6th Street to the intersection with Orange Street. Distance - 0.86 miles.	The right-of-way along this section of South 6th Street amounts to 60 feet. The pavement width between Maurice to Higgins is 44 feet wide while the section west to Orange Street is 30 feet wide. In 1965, the section between Maurice and Higgins Avenue was operated as one-way eastbound. In 1966, the one-way operation was extended to Orange Street and, early in 1967, to Russell Street.	The section of South 6th Street between Maurice Street and Higgins Avenue appears adequate for estimated 19B5 traffic. Between Higgins Avenue and Orange Street, South 6th Street should be widened to 40 feet with two travel lanes and one parking lane. Recommended channelization treatments at major intersections are shown as various illustrations, such as Figure 37, 39 and 41.

Route Description	Existing Conditions	Recommended Improvements
2. From the intersection with Orange Street west along South 6th Street to the intersection with Russell Street. Distance - 0.72 miles.	The right-of-way along this section amounts to 60 feet. The pavement is in poor condition and its width varies from 22 to 40 feet.	The entire section of this route should be widened to 40 feet. Parking should be allowed on one side only. Two travel lanes, one-way eastbound, should be provided.
SOUTH 7th STREET		
Beginning at the intersection with Clements Avenue, east along South 7th Street to Russell Street, east to Inez and then northerly joining South 6th Street. Distance - 3.15 miles.	The right-of-way along this section of South 7th Street is 60 feet. The roadway width varies from 20 to 30 feet.	Twenty feet of right-of-way should be acquired between Clements and Reserve. A forty-foot roadway section should be constructed along the entire section of South 7th Street. East of 27th Avenue, South 7th Street should be operated as one-way street eastbound joining South 6th Street at the intersection of Inez.
CLEMENTS AVENUE		
Clements Avenue between South 7th Street and South Avenue. Distance - 1.02 miles.	The right-of-way along this section amounts to 60 feet between South 7th and Mount and to 66 feet between Mount and South. Pavement width along this section is 26 feet.	New construction along Clements Avenue should be set back to allow eventual acquisition of 80 feet of right-of-way. The condition of Clements Avenue, if properly maintained in the future, appears to serve well the estimated 1985 traffic loads.
SOUTH AVENUE		
1. Beginning at the intersection with Clements Avenue proceeding easterly along South Avenue to Reserve Street. Distance - 1.99 miles.	The right-of-way width along this route is 60 feet with a roadway width of 30 feet.	Forty feet of additional right-of-way should be acquired and the roadway constructed to four travel lanes with a median. Left turn storage lanes should be provided at major intersections.
2. From Reserve Street, east along South Avenue to the intersection with Russell and Brooks Streets. Distance - 1.02 miles.	The right-of-way along this section is 60 feet, widening to 72 feet about 500 feet west of Russell Street.	Additional right-of-way should be acquired to standardize right-of-way along South Avenue to 100 feet. A four-lane median divided roadway section should be constructed with no curb parking. The details of the recommended intersection design of Brooks, Russell and South is shown in Figure 38.
3. From the intersection with Russell Street, east along South Avenue to Higgins Avenue. Distance - 1.00 miles.	The right-of-way along this section is 80 feet wide. The pavement width varies from 30 to 60 feet.	Twenty feet of additional right-of-way should be acquired along this section. A four-lane median divided roadway section should be constructed with no curb parking. The details of the intersection channelization design are shown in Figure 39.

Route Description	Existing Conditions	Recommended Improvements
4. From the intersection with Higgins Avenue, east along South Avenue to the intersection with Arthur Avenue. Distance - 0.38 miles.	The right-of-way along this section is 80 feet. The pavement width varies from 30 to 41 feet.	Twenty feet of additional right-of-way should be acquired and a four-lane median divided roadway with no parking constructed. The recommended channelization design at the intersection with Arthur Avenue is shown in Figure 41.
MULLAN ROAD		
From the intersection with Reserve Street easterly along Mullan Road to the intersection with U. S. Highway 10 and 93. Distance - 0.93 miles.	The existing right-of-way amounts to 60 feet. The pavement, 24 feet wide, is in good condition.	This section of Mullan Road appears adequate for estimated 1985 traffic volumes. New construction, however, should be set back to allow eventual acquisition of right-of-way to a total width of 100 feet.

TABLE X - 4

RECOMMENDED IMPROVEMENTS - SECONDARY ARTERIALS

ROUTE DESCRIPTION	EXISTING CONDITIONS	RECOMMENDED IMPROVEMENTS
WESTERN BY-PASS		
The proposed route proceeds in a southwesterly direction from the intersection of U. S. Highways 10 and 93, crosses the Clark Fork River in the vicinity of the present Harper's Bridge, and intersects County Route 39. Proceeding in a southeasterly direction along Route 39, the by-pass intersects the South Avenue extension and U. S. Highway 93. This realignment would serve the Big Flat area and replace the temporary Harper's Bridge. Distance - approximately 10 miles.	The land in the proposed right-of-way is vacant or in agricultural use. The section of County Route 39 which the route follows has a 24 foot gravel surface.	An 80 foot right-of-way should be acquired for the entire length of this route. Twenty feet of additional right-of-way will be required along that section of the route that follows Big Flat Road and County Route 39. A two lane roadway with shoulders should be constructed, as well as a two lane bridge across the Clark Fork River.
SOUTH AVENUE EXTENSION		
1. Beginning at the intersection of Clements and proceeding west along South Avenue to the Bitterroot River. Distance - 1.30 miles.	South Avenue extends a distance of 1.30 miles from its intersection with Clements to the Bitterroot River. The right-of-way along this section is 60 feet. Surface width from Clements to 45th Street is 21 feet.	Twenty feet of additional right-of-way should be acquired and a two lane roadway constructed.
2. Crossing the Bitterroot River at its intersection with South Avenue, the route proceeds west to Big Flat Road and its intersection with the western by-pass. Distance - 0.15 miles.	The land in the proposed right-of-way is vacant.	A 30 foot wide structure capable of carrying two lanes of traffic should be constructed across the Bitterroot River. A right-of-way of 80 feet will be required from the river to Big Flat Road. An additional 20 feet of right-of-way should be acguired along Big Flat Road to the intersection of the western by-pass route. A two lane roadway should be constructed with channelization at the intersection with the western by-pass route.
41st AVENUE		
Beginning at the intersection of South 7th Street and Hiberta, the route proceeds along Hiberta in a southerly direction to its intersection with Spurgin Road. From Spurgin Road the route continues south to an intersection with North Avenue at which point	The land required by the proposed right-of-way is primarily vacant. At the present time the removal of one or two residences would be required.	An additional 20 feet of right-of-way should be acguired between South 7th Street and Spurgin Road. Eighty feet of right-of-way will be required for a distance of 0.78 miles south to South Avenue. A two lane roadway should be constructed.

TABLE X - 4 (Continued)

ROUTE DESCRIPTION	EXISTING CONDITIONS	RECOMMENDED IMPROVEMENTS
it curves southwest to tie into South Avenue at the intersection of South Avenue and the west access road to Fort Missoula.		
MILLER CREEK ROAD		
Beginning at the intersection of Miller Creek Road and U. S. Highway 12 and 93, the route proceeds south for 0.51 miles to an intersection with Lower Miller Creek Road. The road then proceeds in an easterly direction for a distance of 3.60 miles to the eastern Study Area boundary.	The existing right-of-way along Miller Creek Road is 60 feet. The roadway is 20 feet wide. The section from U. S. Highway 12 and 93 to the west intersection of Lower Miller Creek Road is paved. From this intersection to the Study Area boundary, the roadway is a 20 foot gravel surface, some portions of which have been oiled.	The Miller Creek area is expected to experience substantial future residential growth. An additional 20 feet of right-of-way should be acquired between U. S. Highway 12 and 93 and the intersection of Lower Miller Creek Road. A four lane roadway should be constructed. Building set-backs, to allow future acquisition of 20 feet of additional right-of-way, should be maintained along the remainder of this section.
BROOKS STREET		
1. Beginning at the intersection of Brooks Street and Higgins Avenue the route angles southwest for a distance of 0.66 miles to an intersection with Mount Avenue.	The section of Brooks Street from Higgins Avenue to Mount Avenue is a 40 foot paved, two lane roadway with a 100 foot right-of-way. The roadway is closely lined with large trees for the entire length of the section.	Brooks Street should be widened 12 feet to four lanes with a median for a distance of 500 feet southwest from its intersection with Higgins Avenue. This intersection should be channelized, as shown in Figure 39. From the southern end of this widened section to Mount Avenue, the existing pavement is recommended for operation as a three lane facility, two lanes southbound and one lane northbound. A traffic signal should be installed at Mount Avenue.
2. From Mount Avenue the route continues in a southwesterly direction for a distance of 0.38 miles to an intersection with Middlesex.	The right-of-way width between Mount Avenue and Middlesex is 60 feet. The existing roadway is 45 feet wide, carrying four lanes of traffic with parking on the unpaved shoulders.	An additional 20 feet of right-of-way should be acquired along this section and the roadway widened to accommodate four traffic lanes with a two-way left turn lane, as shown in Figure 38. A traffic signal should be installed at the intersection of Strand. The intersection at Middlesex should be channelized, as shown in Figure 38.
PATTEE CANYON DRIVE		
Beginning at the intersection of Pattee Canyon Drive and S. W. Higgins Avenue, the route proceeds southeast for a distance of 3.60 miles.	The existing right-of-way varies from 70 to 80 feet with a 30 foot paved roadway.	This area is expected to experience substantial residential growth as well as an increasing number of recreation trips. A four lane roadway with no parking should be constructed extending 1.00 mile east from S. W. Higgins Avenue.

TABLE X - 4 (Continued)

ROUTE DESCRIPTION	EXISTING CONDITIONS	RECOMMENDED IMPROVEMENTS
MULLAN ROAD		
Beginning at the intersection of Reserve Street and Mullan Road, the route proceeds in a westerly direction for a distance of 4.00 miles to an intersection with the western by-pass.	The existing right-of-way is 60 feet with a paved 24 foot roadway.	This section of Mullan Road appears to adequately serve the estimated 1985 traffic volumes. New construction should be setback to allow for eventual acquisition of 80 feet of total right-of-way.
SOUTH AIRPORT ROAD		
Originating at the intersection of South Airport Road and U. S. Highway 10 and 93 just east of the Missoula County Airport, the route proceeds southwest crossing the Chicago, Milwaukee and St. Paul Railroad to an intersection with Mullan Road. The length of the section is 2.08 miles.	The required right-of-way for this route is presently agricultural land.	As this area develops, an 80 foot right-of-way should be acquired to provide for a two lane roadway with shoulders.
SCOTT STREET		
1. Beginning at the intersection of Scott Street and U. S. Highway 10 and 93, the route proceeds northeast to its intersection with Toole Avenue, a distance of 0.15 miles.	The existing right-of-way is 80 feet wide with a pavement width of 34 feet. The pavement is in poor condition.	Within the existing right-of-way a four lane divided roadway with no parking should be constructed. The Toole Avenue, Spruce Street intersection should be signalized and channelized as shown in Figure 43. Median breaks with left turn bays should be provided at major cross streets.
2. From Toole Avenue the route proceeds north for a distance of 0.93 miles to Otis Avenue.	The existing right-of-way is 80 feet wide. The pavement varies from 35 to 40 feet in width and in in poor condition.	A four lane divided roadway with no parking should be constructed. Easement across the Northern Pacific tracks should be acquired and a four lane overpass structure constructed as shown in Figure 43.
OTIS STREET - GRANT CREEK ROAD		
Beginning at its intersection with Scott Street the route proceeds west to the Northern Pacific Railroad, turning northwest to parallel the tracks to its intersection with Grant Creek Road. The route then turns north, proceeding to an intersection with Reserve Street. The length of the entire section is 2.36 miles.	The right-of-way width is 80 feet on this section. The road surface is gravel with the exception of the section from the Van Evan Railroad Crossing to Grant Creek Road. The roadway width varies from 32 to 36 feet.	This section appears to be adequate to serve the 1985 travel needs. The roadway should eventually be resurfaced, depending on the need as a result of industrial development.

TABLE X - 4 (Continued)

ROUTE DESCRIPTION	EXISTING CONDITIONS	RECOMMENDED IMPROVEMENT
TOOLE AVENUE		
Beginning at its intersection with U.S. Highway 10 and 93 the route proceeds east 0.34 miles to its intersection with Spruce Street	The right-of-way width varies from 80 to 113 feet on this section. The 40 foot pavement is in poor condition.	This section should be reconstructed to provide a four lane roadway with a median. No additional right-of-way will be required. Existing pavement should be widened and resurfaced, with curbs and gutters installed.
SPRUCE STREET		
Beginning at its intersection with Toole Street, Spruce Street proceeds east, crossing the Bitterroot branch of the Northern Pacific Railroad and ending at an intersection with Railroad Street. The section is 1.00 mile in length.	The existing right-of-way is 100 feet for the entire section. Pavement width varies from 40 feet between Toole Avenue and Orange Street to 60 feet between Orange and Railroad Streets.	The section of Spruce between Toole and Orange Street is recommended for a widening of 14 feet to provide four lanes with parking on one side. Between Orange Street and Railroad Street, the existing width is adequate to provide parallel parking on both sides with four traffic lanes.
MAIN STREET		
Beginning at Orange Street, this street extends eastward for 0.59 miles and terminates at Madison.	The existing right-of-way is 99 feet along the entire section. The pavement width varies from 38 feet at the intersection of Orange Street to 68 feet between Woody and Washington Streets. The street narrows to 46 feet between Washington and Madison Streets. The present pavement condition is poor.	Main Street should continue to operate as the westbound half of the Main-Front Street one-way couplet. The entire section should be resurfaced and parking prohibited between Madison and Clay Streets and between Woody and Orange Streets. Traffic signals should be installed at Clay Street, Pattee Street, and Woody Street. The intersections at Madison, Clay and Orange Streets should be improved and channelized as shown in Figure 42.
FRONT STREET		
Beginning at an intersection with Broadway, this section proceeds southeast for a distance of 0.19 miles to its intersection with Orange Street. Front Street continues eastbound as a one-way street for a distance of 0.64 miles to Madison Street.	The existing right-of-way is 70 feet with the exception of the section between Ryman Street and Higgins Avenue which has a 90 foot right-of-way. The pavement width varies from 30 to 57 feet. The pavement condition is poor.	The section from Broadway to Orange Street is adequate and should be maintained as a two lane, two-way street. The intersection at Orange Street should be channelized as shown in Figure 42. Parking should be prohibited between Orange and Woody Streets. Between Ryman Street and Higgins Avenue, parking should be prohibited to provide three lanes eastbound and one lane westbound. The intersection at Higgins should be channelized. In the section between Higgins Avenue and Pattee Street, parking should be allowed on the north side only. Parking should be prohibited from Pattee to Madison. The section between Clay and Madison should be widened six feet to provide three lanes. The intersection with Madison Street

TABLE X - 4 (Continued)

ROUTE DESCRIPTION	EXISTING CONDITIONS	RECOMMENDED IMPROVEMENTS
		should be channelized as shown in Figures 40 and 41. Traffic signals should be installed at the intersections of Woody, Pattee and Clay Streets. The entire section should be repaved.
MADISON-DUNCAN DRIVE		
1. Beginning at the intersection of Broadway and Madison Street, this section proceeds northeasterly along Madison Street for a distance of 0.21 miles to an underpass at Interstate 90.	North Madison Street has an 80 foot right-of-way with a 45 foot pavement. The intersection with Broadway is signalized.	This section should be widened nine feet within the existing right-of-way to provide four travel lanes with parking on one side.
2. From Interstate 90 the route proceeds in a northeast direction along Duncan Drive to North Highland then curves east crossing Rattlesnake Creek. The route then turns northeast and intersects with Brayton Avenue. The length of this section is 2.20 miles.	The existing right-of-way varies from a minimum of 30 feet to a maximum of 60 feet between Lolo Street and the North Rattlesnake Bridge. The pavement is 24 feet wide.	A 60 foot right-of-way should be acquired for this entire section. A four lane roadway with no parking should be constructed.
VAN BUREN-BRAYTON AVENUE		
Beginning at Interstate 90 this section proceeds along VanBuren, and intersects Brayton about one mile north of Interstate 90. The route continues along Brayton to its intersection with Duncan Drive.	North of Interstate 90 the right-of-way is 60 feet with a pavement width varying from 24 to 36 feet.	The section south of Interstate 90 is adequate to handle estimated 1985 traffic volumes. From Interstate 90 north to its intersection with Duncan Drive at the north Rattlesnake Creek crossing, a four lane roadway with no parking should be constructed.
U. S. HIGHWAY 10 - EAST MISSOULA		
1. Beginning at Interstate 90 East Missoula Interchange, this section proceeds northeasterly for 0.70 miles to its intersection with 6th Street in East Missoula.	The existing right-of-way is 80 feet wide. The existing pavement is 26 feet wide.	This section should be widened to 54 feet to provide four eleven foot lanes, and a ten foot median with left turn pockets.
2. From 6th Street to East Missoula, the route follows U. S. Highway 10 to the Bonner Interchange. The length of this section is 30 miles.	The existing right-of-way is 80 feet with a 26 foot pavement	With proper maintenance this section of roadway will adequately handle the estimated 1985 traffic volumes.

Source: Clark, Coleman & Rupeiks, Inc.

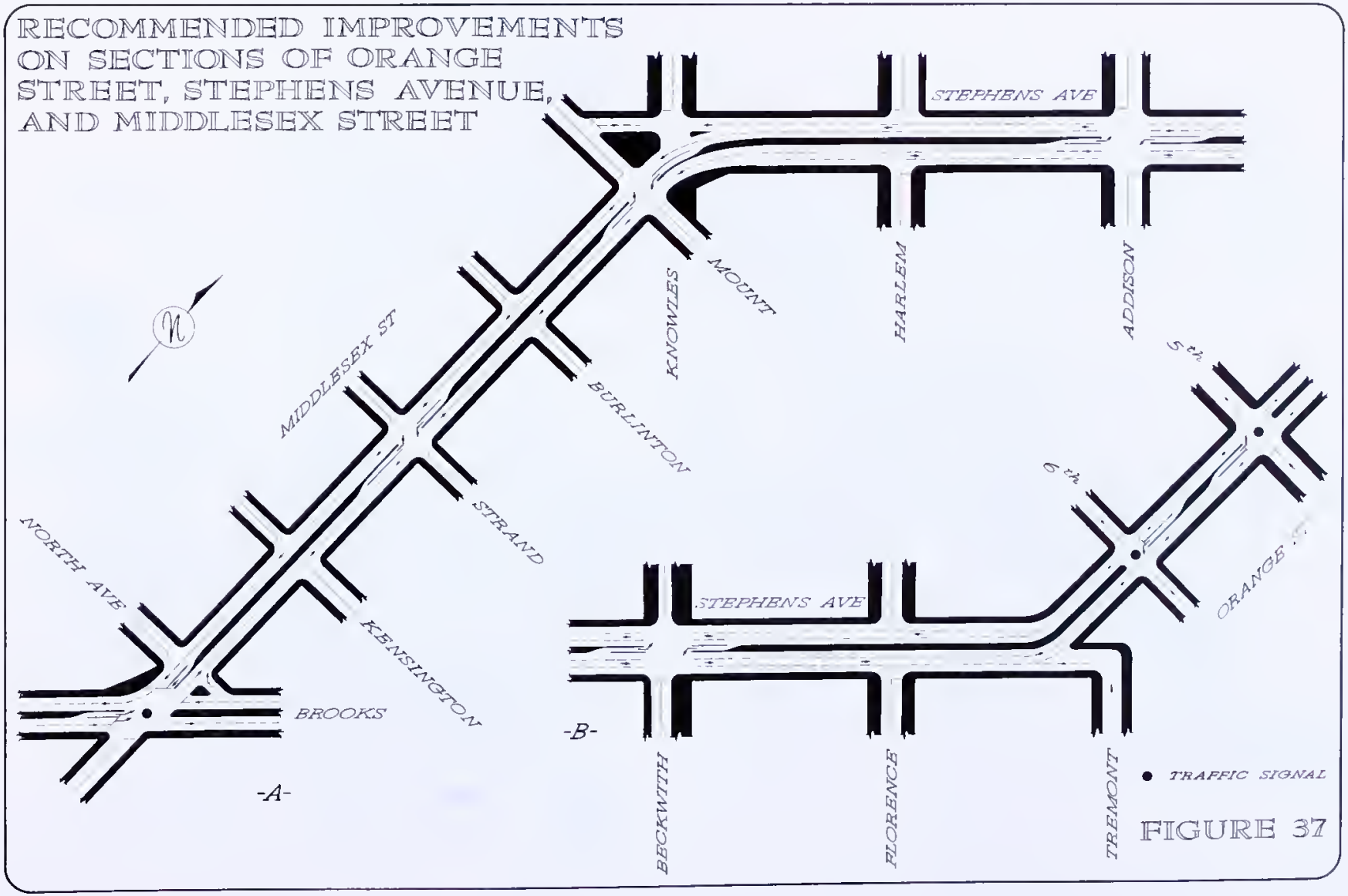

RECOMMENDED IMPROVEMENTS
ON SECTIONS OF ORANGE
STREET, STEPHENS AVENUE,
AND MIDDLESEX STREET
STEPHENS AVE
MOUNT
KNOWLES
HARLEM
ADDISON
5th
6th
ORANGE ST
BURLINTON
MIDDLESEX ST
STRAND
NORTH AVE
KENSINGTON
BROOKS
-A-
STEPHENS AVE
-B-
BECKWITH
FLORENCE
TREMONT
TRAFFIC SIGNAL

FIGURE 37

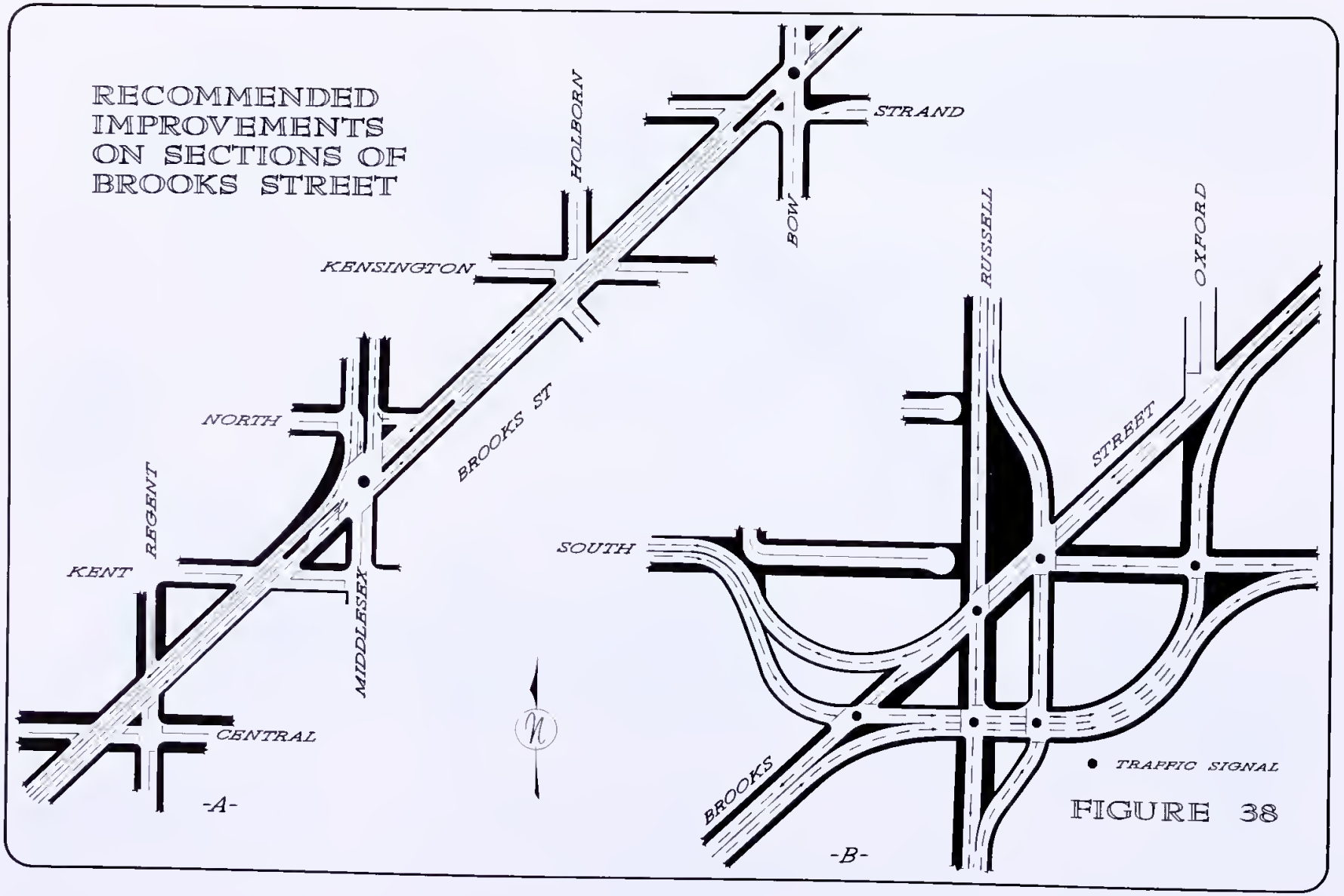

RECOMMENDED IMPROVEMENTS ON SECTIONS OF BROOKS STREET
HOLBORN
STRAND
BOW
KENSINGTON
NORTH
BROOKS ST
REGENT
KENT
MIDDLESEX
CENTRAL
-A-
RUSSELL
OXFORD
STREET
SOUTH
BROOKS
-B-
TRAFFIC SIGNAL

FIGURE 38

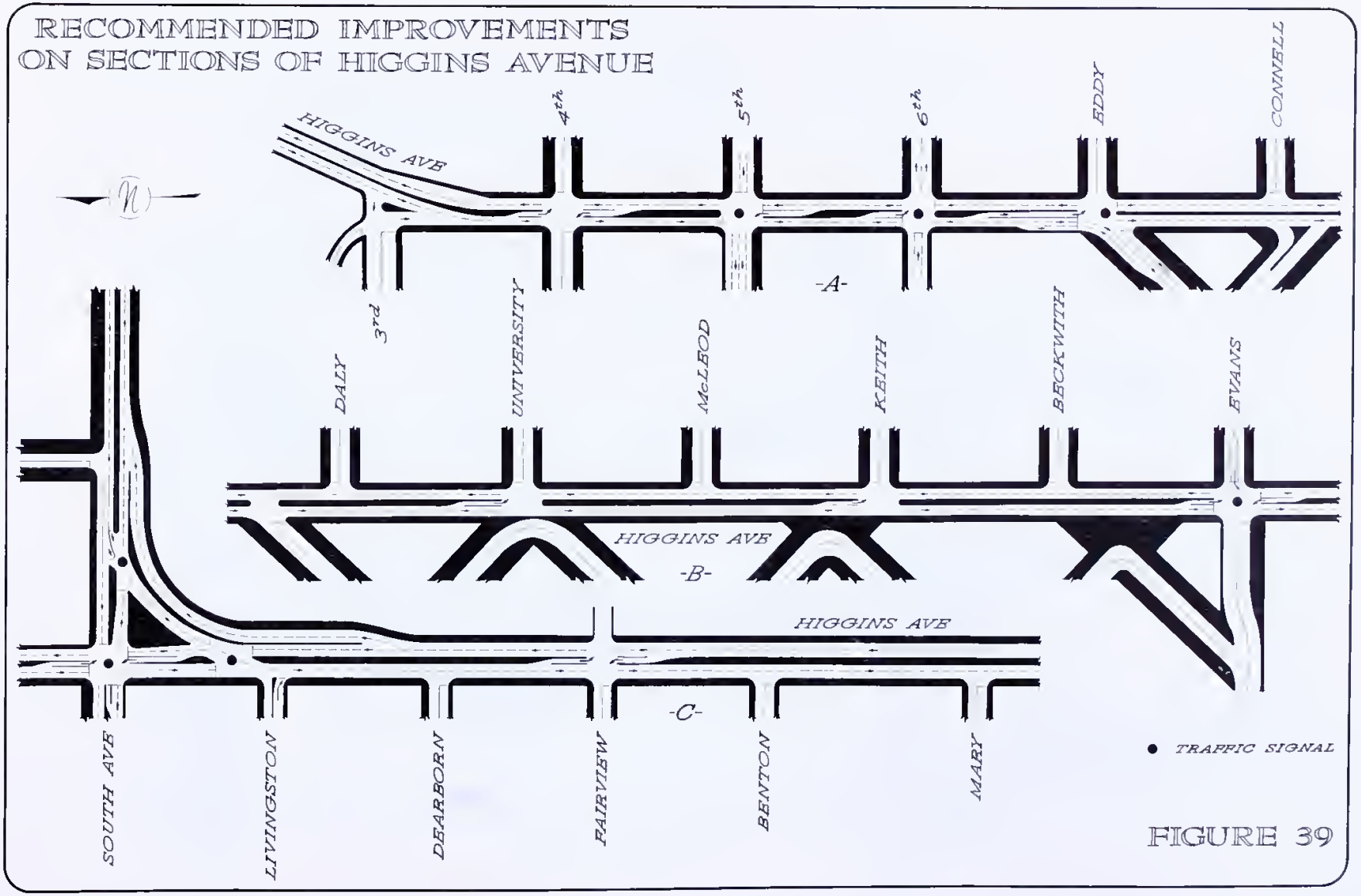

RECOMMENDED IMPROVEMENTS
ON SECTIONS OF HIGGINS AVENUE
HIGGINS AVE
3rd
4th
5th
6th
EDDY
CONNELL
-A-
DALY
UNIVERSITY
McLEOD
KEITH
BECKWITH
EVANS
HIGGINS AVE
-B-
HIGGINS AVE
-C-
SOUTH AVE
LIVINGSTON
DEARBORN
FAIRVIEW
BENTON
MARY
TRAFFIC SIGNAL

FIGURE 39

RECOMMENDED IMPROVEMENTS SECTIONS OF VAN BUREN, FRONT, AND MADISON STREETS

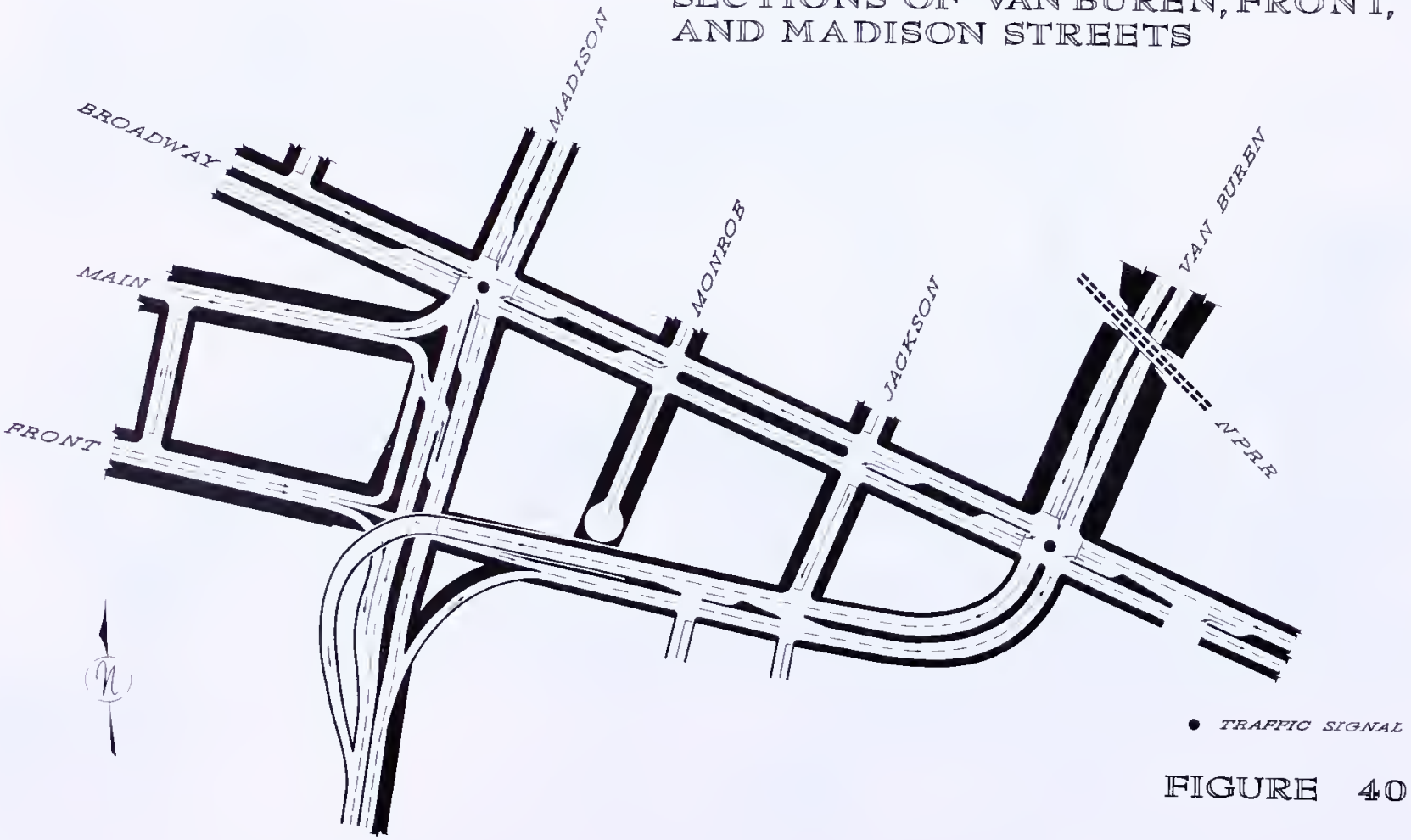


FIGURE 40

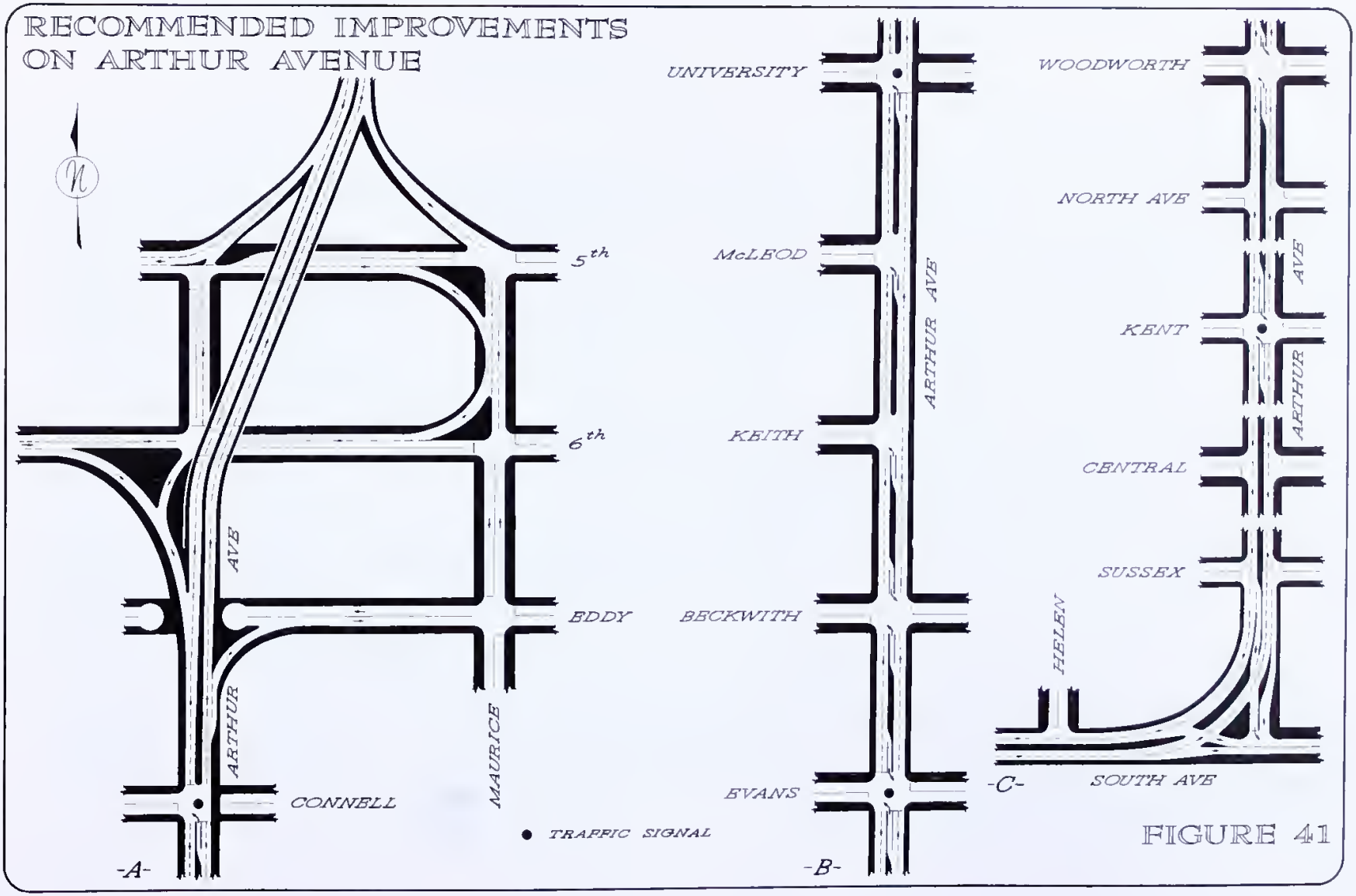

RECOMMENDED IMPROVEMENTS
ON ARTHUR AVENUE
N
5th
6th
EDDY
CONNELL
ARTHUR AVE
MAURICE
-A-
UNIVERSITY
McLEOD
KEITH
BECKWITH
EVANS
ARTHUR AVE
-B-
WOODWORTH
NORTH AVE
KENT
CENTRAL
SUSSEX
HELEN
SOUTH AVE
ARTHUR AVE
-C-
TRAFFIC SIGNAL

FIGURE 41

specific design recommendations have not been made in this report.

However, improvement recommendations and costs have been developed for collector and local access streets in the CBD. These recommendations cover only the facilities that are integral parts of the central area circulation system. Table X-5 outlines the improvement recommendations for specific collector and local access streets in the CBD.

COST OF IMPROVEMENTS

It is essential to the implementation of transportation plan improvements that the general level of costs be established to facilitate advance arrangements and to insure availability of adequate funds when needed.

Development costs for those sections of the recommended transportation plan requiring new or reconstruction were computed on the basis of current units costs. The final cost of each project will be determined by the future scheduling of right-of-way acquisition and construction programming. The existing cost values provide a basis for determining the relative expenditures required to construct the various components of the system, although future prices for construction and right-of-way will exceed current levels.

Although construction and right-of-way costs continue to rise, future cost adjustments in the implementation of the transportation plan can be determined by relating the level of construction bid prices at the time of programming to the estimated costs included in this report. Final costs at the time of construction can be expected to vary, due to influencing factors of construction, contract size, location of job sites and prevailing prices of labor and materials.

The total estimated improvement costs have been divided into two major categories. The first includes construction costs of labor, supervision, materials, equipment, engineering and contingencies. The second includes costs for right-of-way in land and improvements thereon.

Unit Costs

The construction item unit costs, listed in Table X-6, are based on extensive review of unit bid prices received by

TABLE X - 5

RECOMMENDED IMPROVEMENTS - COLLECTOR AND LOCAL ACCESS STREETS

ROUTE DESCRIPTION	EXISTING CONDITIONS	RECOMMENDED IMPROVEMENTS
WOODY STREET		
1. Beginning at the intersection of Spruce Street, this route proceeds southwesterly to an intersection with Main Street, a distance of 0.23 miles.	This section has two travel lanes with parking on both sides. The existing right-of-way is 80 feet in width. The pavement width varies from 45 to 55 feet.	With periodic maintenance this section appears adequate for estimated 1985 traffic volumes. Traffic signals should be installed at Broadway, Front and Main Streets. The details of this recommendation are shown in Figure 42.
2. Beginning at the intersection of Main Street, the route proceeds southwesterly to an intersection with the proposed LeVasseur Street, a distance of 0.25 miles.	The proposed route would displace a number of structures between Main and LeVasseur.	Sixty feet of right-of-way between Front Street and the proposed LeVasseur Street route should be acquired and a 42 foot, two-lane collector street constructed along this route. The details of this recommendation are shown in Figure 42.
LE VASSEUR STREET		
1. Beginning at the intersection of the proposed Woody Street extension this route proceeds southeasterly to an intersection with Pattee Street, a distance of 0.16 miles.	The proposed route passes through land presently used as a free municipal parking lot.	A 42 foot, two lane collector street should be constructed along this route.
2. Beginning at the intersection of Pattee Street, the route continues along Le Vasseur Street to an intersection with Clay Street, for a distance of 0.06 miles.	The existing street is in poor condition with a pavement width about 24 feet.	A 42 foot, two lane street should be constructed along this route.
CLAY STREET		
Beginning at LeVasseur, this route proceeds northeasterly to an intersection with Spruce Street. The length of the section is 0.25 miles.	The existing right-of-way along this section is 80 feet in width. Pavement along this section is 30 feet wide from LeVasseur to Front Street where it terminates. From Main Street to Spruce, the width is 50 feet.	The section from LeVasseur to Front Street should be widened to 42 feet to provide two traffic lanes and parking on both sides. Washington Street should be closed and 60 feet of right-of-way acquired between Front and Main Streets to allow Clay Street a straight alignment from LeVasseur to Spruce Street. Traffic signals should be installed at the Front, Main and Broadway intersections. The details of this recommendation are shown in Figure 42.

TABLE X - 5 (Continued)

ROUTE DESCRIPTION	EXISTING CONDITIONS	RECOMMENDED IMPROVEMENTS
RYMAN STREET		
1. Beginning at Broadway, this route proceeds southwesterly to an intersection with Front Street, for a distance of 0.12 miles.	The existing right-of-way is 80 feet with a pavement width of 66 feet.	This section appears adequate for 1985 estimated traffic volumes provided that the angle parking is replaced by parallel parking.
2. Beginning at Front Street, this route proceeds southwesterly to an intersection with the proposed LeVasseur route for a distance of 0.07 miles.	This is presently an entrance to the municipal parking lot.	A 42 foot, two lane street should be constructed along this route.

Source: Clark, Coleman & Rupeiks, Inc.

TABLE X - 6

UNIT CONSTRUCTION COSTS

Item	Unit	Unit Cost[a]
Clearing, grubbing and demolition	Acre	$ 800.00
Excavation	Cubic yard	1.00
Embankment	Cubic yard	1.20
Storm drainage	Lineal foot	14.00
Surface and base	Square yard	4.00
Widen existing roadway	Square yard	10.00
Construct 16-20 foot median	Lineal foot	12.00
Construct 4 foot median	Lineal foot	8.00
Curb and gutter	Lineal foot	3.00
Concrete sidewalk	Lineal foot	2.00
Signing and striping	Mile	1,000.00
Lighting	Mile	25,000.00
Structures	Square foot	10.50
Signalization	Each	9,000.00
Landscaping	Mile	600.00
Plate guard rail	Lineal foot	5.00
Engineering and contingencies	Percent of Const.	10%

[a]Represent 1967 conditions

Source: Clark, Coleman & Rupeiks, Inc.; Reviewed by Montana Department of Highways

RECOMMENDED IMPROVEMENTS ON CBD ARTERIALS

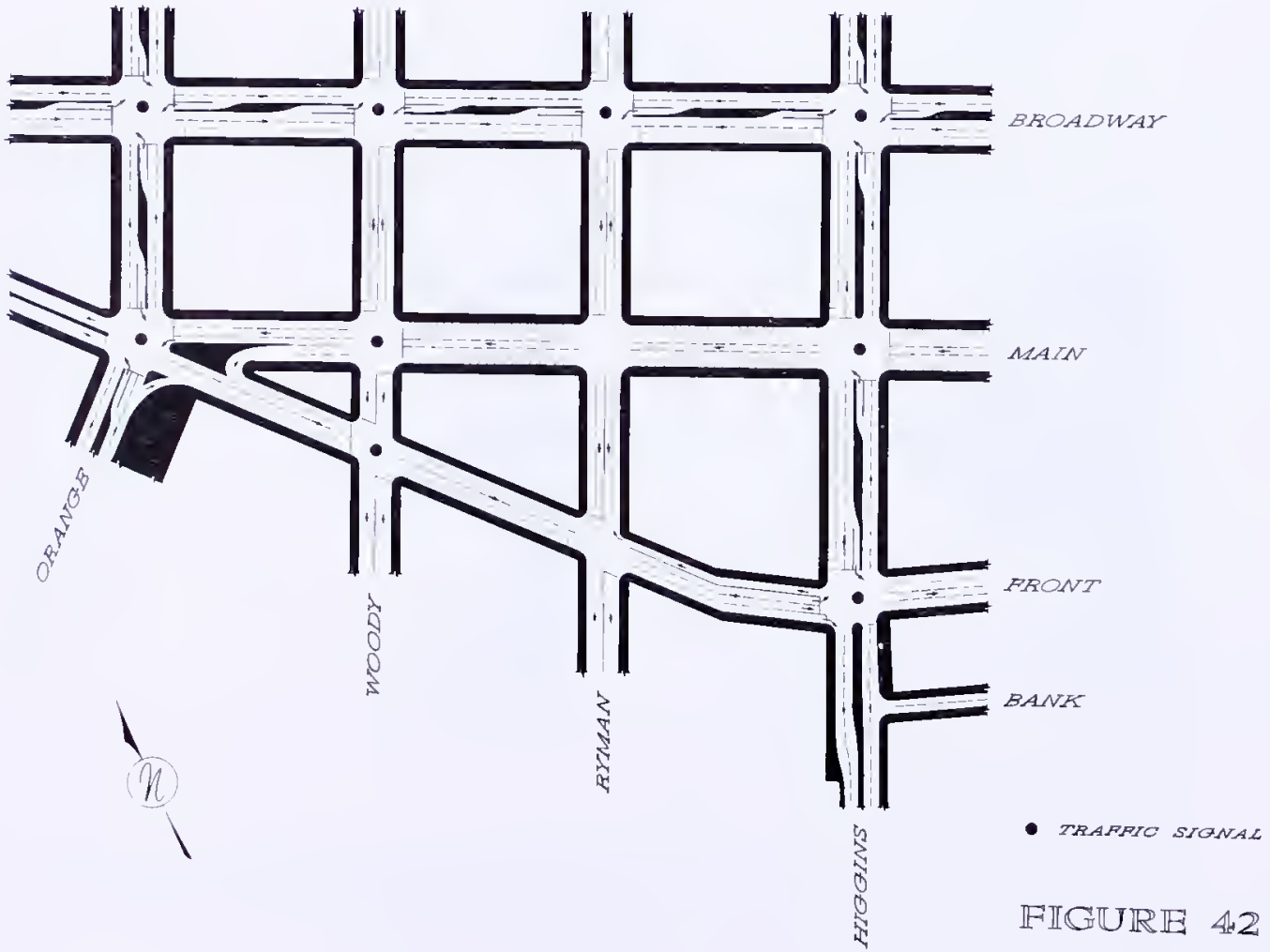


FIGURE 42

RECOMMENDED IMPROVEMENTS ON CBD ARTERIALS

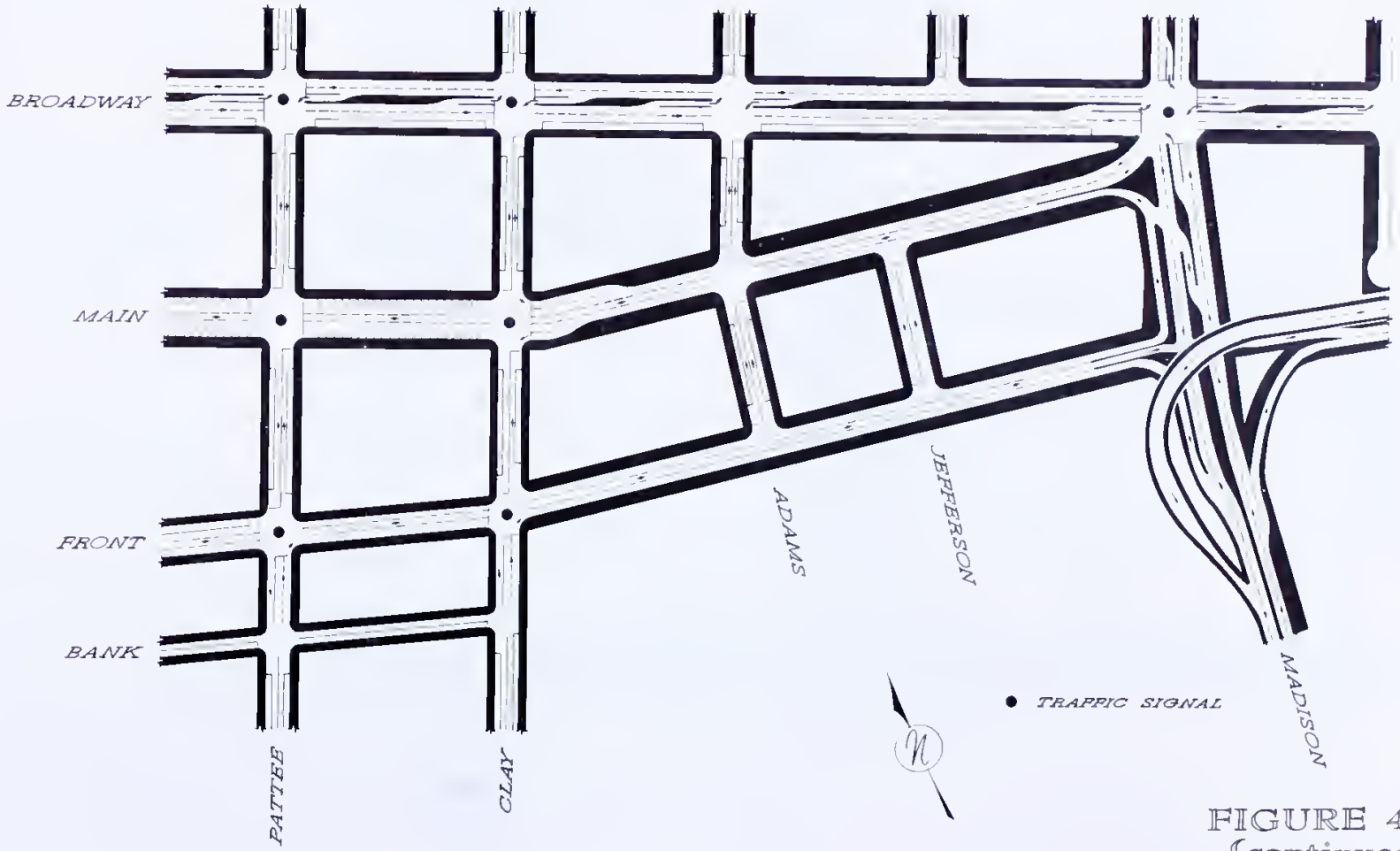


FIGURE 42
(continued)

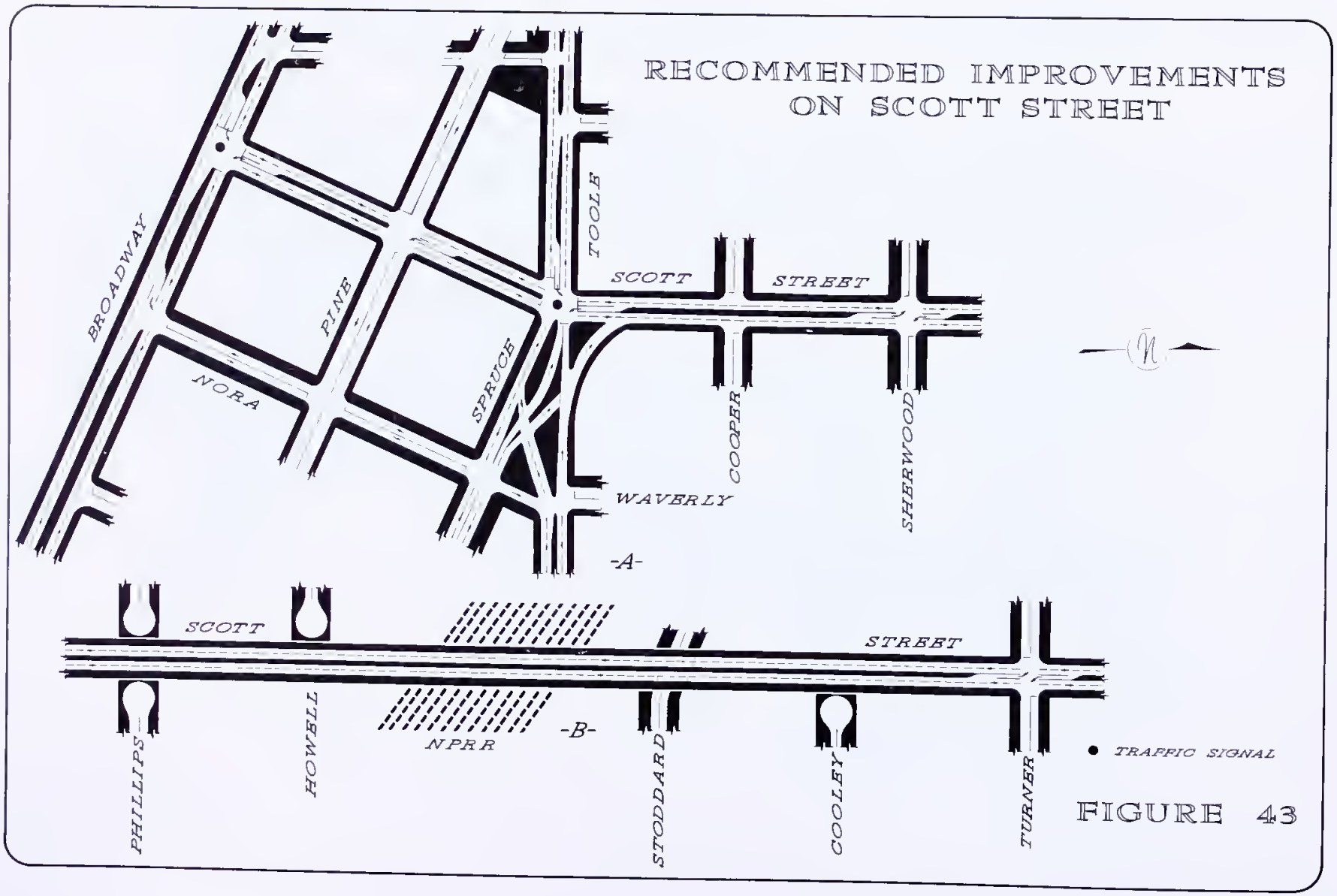

RECOMMENDED IMPROVEMENTS
ON SCOTT STREET
BROADWAY
NORA
PINE
SPRUCE
TOOLE
SCOTT
STREET
COOPER
SHERWOOD
WAVERLY
-A-
SCOTT
STREET
PHILLIPS
HOWELL
NPRR
-B-
STODDARD
COOLEY
TURNER
TRAFFIC SIGNAL
N

FIGURE 43

the Montana Department of Highways for various construction projects, modified to reflect conditions in the Missoula area. These unit costs were reviewed with state and local officials.

Right-of-way costs for all proposed improvements were developed from the data available on property assessments. Structure costs were based on an average cost per square foot as determined from bid prices received from recent projects by the Montana Department of Highways.

Improvements Cost

Construction and right-of-way cost estimates prepared for each section of recommended improvements are outlined in Table X-7. Each section of roadway or segment of improvement is identified with termini established as names of intersecting routes or streets. The section description corresponds to the section descriptions in Tables X-3, X-4, and X-5, and also includes the length of the project, the existing pavement and right-of-way width, estimated 1985 average weekday traffic volumes and the recommended number of travel lanes, pavement and right-of-way width. The program stage, which is further summarized in the following chapter is also indicated.

A summary of costs by functional classification is shown in Table X-8. A total of $18,859,200 is required to be expended over the twenty year plan period to bring the system of streets and highways up to a level meeting 1985 traffic demands. The high cost of improvements and shortage of funds over the twenty year plan period may necessitate postponement of some projects beyond the twenty year plan period.

Of the total cost of improvements, $7,961,400 or 42.2 percent is in new construction and $10,897,800 or 57.8 percent is in reconstruction of existing facilities. The construction costs amount to $14,193,100 or 75.3 percent, while the right-of-way costs are $4,666,100 or 24.7 percent. A little less than one-third of the cost of new construction is in the cost of right-of-way, while the right-of-way cost in reconstruction of existing facilities amounts to about 20 percent.

Primary Arterials. Five major projects totaling 4.46 miles of construction are included in the category of new construction of primary arterials. Of this, 2.29 miles are along Reserve Street. The new construction of primary arterials amounts to $5,108,200, of which $3,823,200 or 75 percent is in construction and $1,285,000 or 25 percent is in right-of-way cost.

TABLE X - 7

COSTS OF RECOMMENDED STREET IMPROVEMENTS

	Length in Miles	Existing Width Paved	Existing Width R.O.W.	Traffic Volumes 1985 AWD	Number of Lanes	Proposed Width Paved	Proposed Width R.O.W.	Estimated Costs Const.	Estimated Costs R.O.W.	Estimated Costs Total	Program Stage
PRIMARY ARTERIALS - NEW CONSTRUCTION											
1. Reserve Street											
Grant Cr. Rd.-Sugar Beet Lane	0.74	-	-	4,800	2	40	150	550,000	240,000	790,000	Under Const.
Mullan Rd.-S. 3rd Street	1.27	-	-	11,300	2	40	150	746,000	239,000	985,000	I
U.S. 12 & 93-39th Street	0.28	-	-	6,500	2	40	100	52,800	23,200	76,000	I
2. Orange Street											
N.P.R.R. Underpass	0.11	-	-	19,400	2	24	50	948,700	90,000	1,038,700	II
Clark Fork River Bridge	0.18	-	-	21,000	2	24	50	521,300	85,000	606,300	II
3. Brooks Street											
South and Russell Intersection	-	-	-	40,800	-	-	-	202,600	130,500	333,100	I
Dixon-Miller Creek Road	1.19	-	-	12,100-16,400	4	70	100	341,300	325,000	666,300	I
4. VanBuren-Madison-Arthur											
Front-Madison Ramps	0.08	-	-	16,800	2	30	50	142,900	33,600	176,500	III
5th and 6th Overpass	0.10	-	-	26,000	4	56	100	243,900	57,700	301,600	III
5. South 5th Street											
Eaton St.-South 7th Street	0.51	-	-	5,600	2	40	60	73,700	61,000	134,700	II
Subtotal - New Construction	4.46	-	-		-	-	-	3,823,200	1,285,000	5,108,200	
PRIMARY ARTERIALS - RECONSTRUCTION											
1. Reserve Street											
I-90-Grant Creek Road	0.25	-	60	3,400	2	40	150	20,500	2,500	23,000	Under Const.
U.S. 10 & 93-Mullan Road	0.95	-	45-50	7,900	2	40	150-180	9,300	77,700	87,000	I
South 3rd Street-U.S. 12 & 93	1.96	24	60	5,600-11,800	4	70	100	494,400	199,600	694,000	II
2. Russell Street											
U.S. 10 & 93-South 3rd Street	0.75	24-28	70-150	13,000	4	70	100	186,500	22,900	209,400	III
South 3rd St.-South Avenue	1.25	40-24	73-94	10,800-13,500	4	70	100	275,800	15,900	291,700	III
3. Orange Street											
I-90-Broadway	0.55	28-47	80	15,300-19,800	4	70	100	131,100	80,200	211,300	II
Broadway-Stephens	0.82	30-40	80	19,300-25,400	4	70	100	218,100	105,100	323,200	I

TABLE 3 - 7 (Continued)

	Length of Links	Existing Width Paved	Existing Width R.O.W.	Traffic Volumes 1985 AWD	Number of Lanes	Proposed Width Paved	Proposed Width R.O.W.	Estimated Cost Const.	Estimated Cost R.O.W.	Total	Priority Class
4. Stephens Avenue											
Orange-Mount	0.68	50	124	23,900-26,200	4	70	124	336,900	-	336,900	II
5. Middlesex Avenue											
Mount-Brooks	0.28	30	60	19,400	4	70	100	48,000	71,200	121,300	III
6. Brooks Street											
Middlesex-Russell	0.36	44	60	25,600	4	70	100	76,500	111,100	187,600	I
Russell-Dixon	0.80	24-40	60	14,900-21,300	4	70	100	80,000	254,300	334,300	I
7. Higgins Avenue											
Broadway-Brooks	0.42	55-66	80-99	14,000-18,600	5	55-66	80-99	47,600	-	47,600	III
Brooks-South Avenue	0.85	45-50	80	5,900-9,600	4	70	100	173,500	-	173,500	II
South Avenue-Pattee Canyon Dr.	0.31	37-40	80	6,200	4	70	100	223,200	-	223,200	IIL
8. 39th Street											
Russell-U.S. 12 & 93	1.43	25	60-80	1,900-6,600	2	25-34	100	13,000	-	13,000	II
9. VanBuren-Madison-Arthur											
I-90-Madison	2.73	40-72	60-80	21,800-32,300	4	70	100	121,600[a]	43,100	164,700[a]	III
Arthur-South Avenue	1.66	30	80	11,300-26,000	4	70	100	235,500	47,500	282,000	III
10. U.S. 10 & 93											
Study Area Boundary-Reserve	4.14	38	80	11,100	4	70	100	1,045,000	166,000	1,211,000	IV
Reserve-Russell	1.75	32	80	6,600-14,100	4	70	100	517,700	82,000	599,700	I
11. Broadway											
Russell-Orange	1.02	30-50	100-113	8,400-10,500	4	70	100-113	290,100	-	290,100	II
Orange-VanBuren	0.80	70-50	100	15,500	4	66	100	51,800	-	51,800	II
12. South 6th Street											
Higgins-Orange	0.29	30-44	60	7,100	2	40	60	32,200	-	32,200	II
Orange-Russell	0.72	25-40	60	7,800	2	40	60	116,500	-	116,500	II
13. South 7th Street											
Clements-Inez	3.15	20-30	60	1,600-9,700	2	40	80	141,400	102,500	243,900	II

TABLE X - 7 (Continued)

	Length in Miles	Existing Width Paved	Existing Width R.O.W.	Traffic Volumes 1985 AWD	Number of Lanes	Proposed Width Paved	Proposed Width R.O.W.	Estimated Costs Const.	Estimated Costs R.O.W.	Estimated Costs Total	Program Stage
11. South Avenue											
Clements-Reserve	1.99	30	60	2,800-7,000	4	70	100	507,300	210,000	717,300	III
Reserve-Brooks	1.02	30-72	60	8,800-8,800	4	70	100	225,700	105,000	330,700	III
Brooks-Higgins	1.00	30-60	80	10,000-11,300	4	70	100	227,400	106,000	333,400	III
Higgins-Arthur	0.38	30-41	80	6,900	4	70	100	86,400	40,000	126,400	III
Subtotal-Reconstruction	29.42							5,932,500	1,844,400	7,776,900	
SECONDARY ARTERIALS - NEW CONSTRUCTION											
1. Western By-Pass											
U. S. 10 & 93-Big Flat Road	6.95	-	-	2,300	2	40	80	500,500	724,500	1,225,000	IV
Clark Fork River Bridge	0.10	-	-	2,300	2	40	80	205,500	10,500	216,000	IV
2. South Avenue Extension											
Bitterroot River Bridge	0.10	-	-	1,200	2	40	80	181,500	-	181,500	IV
Bitterroot River-Western By-Pass	0.15	-	-	1,200	2	40	80	14,600	10,500	25,100	IV
3. 31st Avenue											
Spurgin Road-South Avenue	0.78	-	-	800	2	40	80	75,000	165,000	240,000	III
4. South Airport Road											
U.S. 10 & 93-Mullan Road	2.08	-	-	400	2	40	80	146,300	219,000	365,300	IV
5. Scott Street											
N.P.R.R. Overpass Structure	0.10	-	-	5,000	4	50	80	330,700	R.R. easement	330,700	III
6. Duncan Drive											
Rattlesnake Creek Structure	0.05	-	-	2,900	4	50	80	105,000	10,000	115,000	III
Subtotal - New Construction	10.31							1,559,100	1,139,500	2,698,600	
SECONDARY ARTERIALS - RECONSTRUCTION											
1. Western By-Pass											
Big Flat Road-U.S. 12 & 93	3.05	-	60	2,100	2	40	80	220,500	80,500	301,000	IV
2. South Avenue Extension											
Clements-Bitterroot River	1.30	21	60	1,900	2	40	80	207,700	43,900	251,600	IV

TABLE X - 7 (Continued)

	Length in Miles	Existing Width Paved	Existing Width R.O.W.	Traffic Volumes 1985 AWD	Number of Lanes	Proposed Width Paved	Proposed Width R.O.W.	Estimated Costs Const.	Estimated Costs R.O.W.	Total	Priority Group
3. 41st Avenue											
S. 7th Street-Sprague Road	0.25	-	60	900	2	40	80	25,500	13,000	38,500	III
4. Miller Creek Road											
U.S. 12 & 93-Lower Miller Creek Road East	1.50	20	60	6,100	4	54	80	139,900	1,500	139,400	IV
5. Brooks Street											
Higgins-Mount	0.66	40	100	10,300	3-4	40-54	100	19,300	6,000	25,300	IV
Mount Avenue-Middlesex	0.38	45	60	11,300	4	54	80	161,800	40,000	201,800	IV
6. Pattee Canyon Drive											
S. W. Higgins-1 mile east	1.00	30	70-80	2,300-7,500	4	54	80	180,000	-	180,000	IV
7. Scott Street											
U.S. 10 & 93-Toole Avenue	0.15	35	80	5,200	4	54	80	38,500	-	38,500	III
Toole Avenue-Otis Avenue	0.93	35-40	80	3,400-5,000	4	54	80	247,200	2,000	249,200	III
8. Toole Avenue											
U.S. 10 & 93-Spruce Street	0.34	40	80-113	5,100	4	54	80	47,700	-	47,700	IV
9. Spruce Street											
Toole Avenue-Railroad	1.00	40	100	7,500	4	54	80	69,800	-	69,800	IV
10. Main Street											
Orange-Madison	0.59	46-68	99	4,600-12,500	2-3	46-68	99	107,200	-	107,200	IV
11. Front Street											
Orange-Madison	0.83	30-57	70-90	7,300-11,000	2-3	36-57	70-90	153,700	-	153,700	IV
12. Madison-Duncan Drive											
Broadway - I-90	0.21	45	80	32,300	4	54	80	32,700	-	32,700	III
I-90-Brayton	2.20	24	30-60	2,900-8,400	4	54	80	576,900	62,500	639,400	III
13. VanBuren-Brayton											
I-90-Duncan Drive	1.80	24-72	60-80	3,200-8,200	4	54	80	364,000	47,700	411,700	III
14. U.S. 10-East Missoula											
E. Missoula Interchange-6th Street	0.70	26	80	5,200	4	54	80	136,600	-	136,600	III
Subtotal - Reconstruction	16.89							2,764,500	309,600	3,074,100	

TABLE X - 7 (Continued)

	Length in Miles	Existing Width Paved	Existing Width R.O.W.	Traffic Volumes 1985 AWD	Number of Lanes	Proposed Width Paved	Proposed Width R.O.W.	Estimated Costs Const.	Estimated Costs R.O.W.	Estimated Costs Total	Program Stage
COLLECTOR STREETS - NEW CONSTRUCTION											
1. Woody Street Main-LeVasseur	0.25	-	-	b	2	42	60	28,300	48,600	76,900	II
2. LeVasseur Street Woody-Pattee	0.22	-	-	b	2	42	60	32,800	-	32,800	II
3. Clay Street Front-Main	0.06	-	-	b	2	42	60	10,100	16,800	26,900	II
Subtotal - New Construction	0.53							71,200	65,400	136,600	
COLLECTOR STREETS - RECONSTRUCTION											
1. LeVasseur Street Pattee-Clay	0.07	-	40	b	2	42	60	10,500	22,200	32,700	II
2. Clay Street LeVasseur-Front	0.13	30	80	b	2	42	60	14,100	-	14,100	II
Subtotal - Reconstruction	0.20							24,600	22,200	46,800	
LOCAL ACCESS STREETS - NEW CONSTRUCTION											
1. Ryman Street Front-LeVasseur	0.12	-	-	b	2	42	60	18,000	-	18,000	II
Subtotal - New Construction	0.12							18,000		18,000	
TOTAL	61.93							14,193,100	4,666,100	18,859,200	
Currently Under Construction	0.99							570,500	242,500	813,000	
NET CONSTRUCTION PROGRAM	60.94							13,622,600	4,423,600	18,046,200	

[a]Includes the estimated cost of improvements on the Interstate

[b]Low volumes

Source: Clark, Coleman & Rupeiks, Inc.

TABLE X - 8

SUMMARY OF IMPROVEMENT COSTS

	Miles	COSTS Const.	R.O.W.	Total	Percent
Freeway					
Reconstruction		$ 18,000	$	$ 18,000	0.1
Primary Arterials					
New Construction	4.46	3,823,200	1,285,000	5,108,200	27.1
Reconstruction	29.42	5,914,500	1,844,400	7,758,900	41.1
Subtotal	33.88	9,737,700	3,129,400	12,867,100	68.2
Secondary Arterials					
New Construction	10.31	1,559,100	1,139,500	2,698,600	14.3
Reconstruction	16.89	2,764,500	309,600	3,074,100	16.3
Subtotal	27.20	4,323,600	1,449,100	5,772,700	30.6
Collector Streets					
New Construction	0.53	71,200	65,400	136,600	0.7
Reconstruction	0.20	24,600	22,200	46,800	0.3
Subtotal	0.73	95,800	87,600	183,400	1.0
Local Access Street					
New Construction	0.12	18,000		18,000	0.1
TOTAL	61.93	14,193,100	4,666,100	18,859,200	100.0
New Construction	15.42	5,471,500	2,489,900	7,961,400	42.2
Reconstruction	46.51	8,721,600	2,176,200	10,897,800	57.8

Source: Clark, Coleman & Rupeiks, Inc.

Thirteen major projects totaling 29.42 miles are categorized as reconstruction, amounting to $7,758,900. Of this total, $5,914,500 or 76 percent, is in construction and $1,844,400 or 24 percent, is in right-of-way cost.

The improvements on primary arterials amount to $12,867,100 or 68.2 percent, of the total improvement costs. Of this total, 40 percent is in new construction and 60 percent in reconstruction of existing facilities.

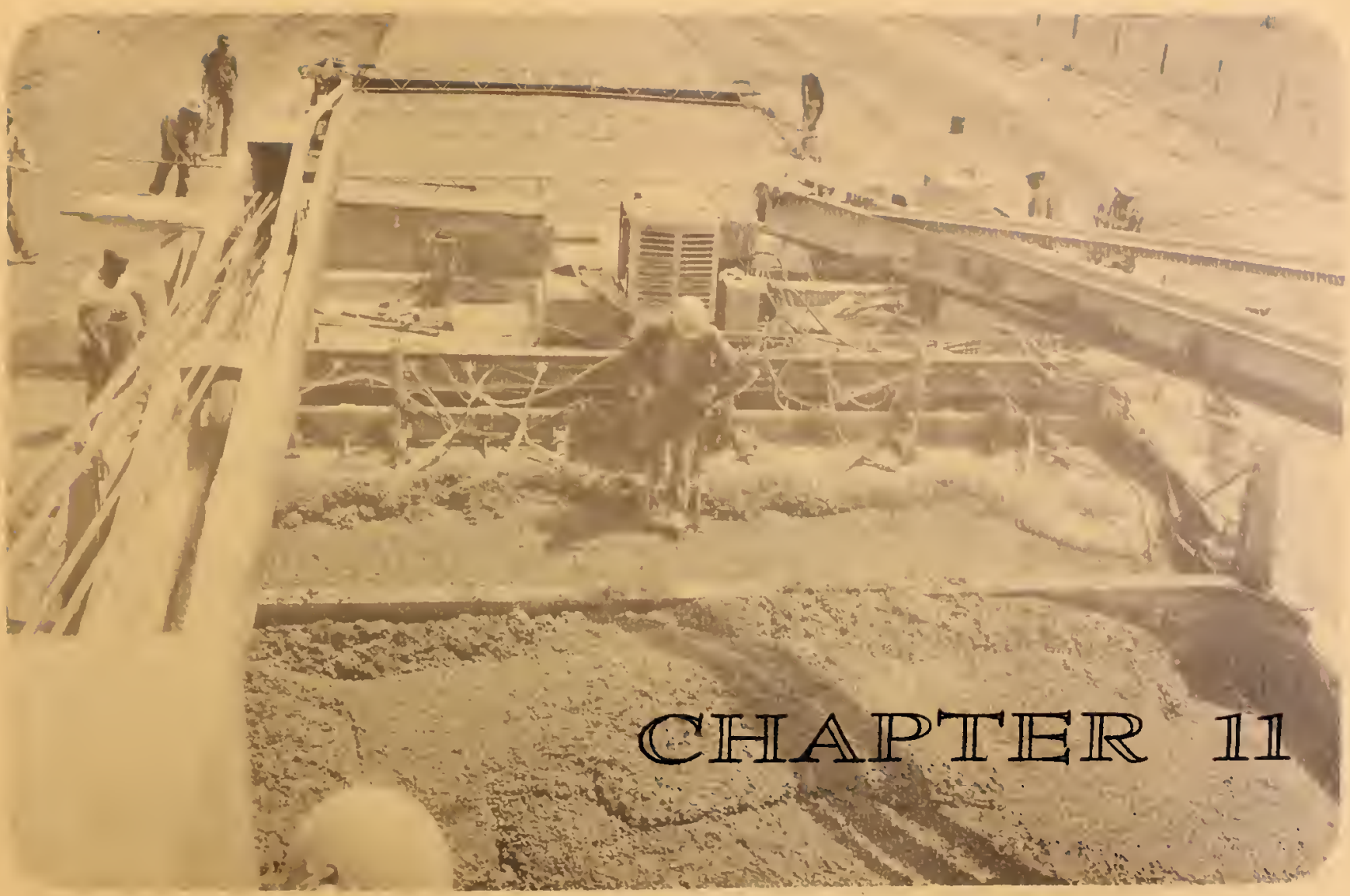
Secondary Arterials. A total of 10.31 miles of secondary arterials are recommended for new construction at a total cost of $2,698,600 of which $1,559,100 or 58 percent, is in construction and $1,139,500 or 42 percent, in right-of-way. The western by-pass facility accounts for 53 percent of the total cost of new construction.

A total of 16.89 miles of secondary arterials are recommended for reconstruction at a total cost of $3,074,100 of which $2,764,500 or 90 percent, is in construction and $309,600 or 10 percent, is in right-of-way cost.

Total improvement costs on the secondary arterial system amount to $5,772,700 of which $4,323,600 or 75 percent, is in construction and $1,449,100 or 25 percent, is in right-of-way cost. Of the total secondary arterial improvement cost, 47 percent is in new construction and 53 percent in reconstruction.

Secondary arterial improvement costs amount to 30.6 percent of the total system improvement cost. Secondary and primary arterial improvements combined constitute 98.8 percent of the total recommended improvement costs.

Collector and Local Access Streets. A total of 0.85 miles of collector and local access streets are recommended for improvement at a total cost of $201,400. All of the improvements on the collector and local access street system take place in the CBD.



CHAPTER 11

CHAPTER XI PLAN IMPLEMENTATION

Previous chapters have discussed the urban transportation planning process, the recommended transportation plan and the costs involved in upgrading the system to established standards. This chapter sets forth a broad framework for economic and policy decisions associated with the implementation of the urban transportation plan. It presents some of the approaches to system financing, explores the economic issues underlying policy formation, outlines a system of improvement priorities and suggests ways in which the various governmental structures can achieve more effective urban transportation in the Missoula area.

Within the scope of this study, it has not been possible to fully analyze all facets of urban transportation finance and organization in the State of Montana or the Missoula area. Rather, emphasis has been placed on those principles and practices which are established or have a definite probability of acceptance and application.

ECONOMIC AND POLICY CONSIDERATIONS

Improvement of transportation systems has traditionally lagged behind the real needs of a community as a result of the unprecedented growth in automobile usage and the natural delays in appropriating funds for improvements. The lag is a direct outgrowth of the difficulties inherent in translating plans into actual construction.

Economic and policy decisions are important in that they are concerned with a significant portion of the urban area's potential investment. This is analagous to the urban consumer's personal budget, where 12 percent of the expenditures are related to transportation. These decisions will govern the magnitude of investment and the sources and allocation of funds among political jurisdictions, thus influencing the productivity of urban areas and the quality of urban living.

Economic and policy decisions and related financial principles occupy a critical role in achieving urban transportation betterments. These decisions must be made with great

care and objectivity, relating the motoring public's preferences to physical and political constraints, costs and availability of funds. On major fiscal questions, consensus among the public, the elected representatives and the administrators is a necessity.

Funds Available

In theory, it would be ideal if all needed street and highway improvements in an urban area were totally financed by the users. Such support would permit key fiscal decisions for urban transportation improvements to be made on economic principles. Experience, however, indicates that total reliance on user support is impractical, particularly in light of the direct and indirect non-user benefits conferred by urban transportation facilities.

Federal. Federal excise taxes are levied on automobiles, trucks, buses and trailers; parts and accessories; tires, tubes and tread rubber; motor fuel, at the rate of 4 cents per gallon; lubricating oil; and on trucks over 26,000 pounds. An estimated $24,388,000 in such taxes were collected in Montana during 1965. In fiscal year 1967, the federal user taxes paid back to the State amounted to $50,917,000. In general, the State of Montana has been receiving federal funds for highways in excess of collections. Other federal highway funds in Montana for fiscal year 1967 amounted to $1,061,000. The majority of federal user tax apportionments are spent on construction and improvement of the Federal-Aid highway system. Of the estimated $48,807,000 in federal funds available to the State for fiscal year 1968, $34,433,000 has been budgeted for the Interstate Highway system, $8,146,000 for the primary, $5,654,000 for the secondary and $574,000 for the urban system.

Although the present law anticipates completion of the Federal Interstate Highway system by 1972, it is generally recognized among State Highway officials, federal administrators and Congressional representatives that the completion date is almost certain to be extended to 1975. It is also the present consensus that the primary, secondary and urban funds will be maintained at the current level until such time as the Interstate system is completed. As far as the State of Montana is concerned, the Interstate apportionment will have to be increased significantly in order to complete the system to four lanes in the State. The latest cost estimate submitted to Congress shows that it would

require $460,192,000 to complete the system in Montana with the needs that existed as of January 1, 1967.

It is generally assumed that at the completion of the Interstate Highway system, a greater proportion of federal funds will be available for the primary, secondary and urban systems. However, specific estimates of the amounts cannot be made because such decisions require future congressional action.

State. The major portion of the State funds for highways comes from the six cent per gallon gasoline tax. Diesel fuel is taxed nine cents per gallon for fuel used on public highways or on highway construction. In fiscal year 1967, the State credited to the State Highway Fund a net amount of about $24,388,000.

Beginning July 1, 1967, the State of Montana increased the gasoline tax by one-half cent per gallon. This increase will result in an estimated net revenue gain of about $1,500,000 in fiscal year 1968. Of this money, $900,000 will be distributed to the incorporated areas and $600,000 to the counties.

Other highway user revenue in fiscal year 1967, from sources such as motor vehicle taxes, amounted to about $4,630,000. Additional non-user revenues were $309,000.

In fiscal year 1967, the State of Montana credited to the State Highway Fund a total of $78,001,000 from the following sources: State highway user taxes $25,714,000; federal funds $51,978,000; other sources $309,000. About 50 percent of the non-federal revenue collected by the State was allocated for construction and reconstruction and about 40 percent was allocated for maintenance of the highway system.

In fiscal year 1967, $13,860,000 was allocated for construction and improvement of the Federal Aid Highway System as matching money to the federal apportionments. The State's share of the allocation for construction amounted to $2,916,000 on the Interstate system, $6,203,000 on the primary system, $4,305,000 on the secondary system and $437,000 on the urban sections. On a percentage basis, the State's share of the improvement of the Interstate system amounts to 8.8 percent of the total construction cost. The State's share of constructing and improving the primary,

secondary and urban sections amounts to 43.3 percent of the total construction costs. The remaining 91.2 percent of the Interstate and 56.7 percent of other federal aid highway construction costs are paid from federal funds.

The State of Montana is divided into twelve Highway Financial Districts. Missoula County is in Financial District No. 8, which also includes Granite, Mineral, Powell, Ravalli and Sanders Counties. The distribution of State constructions funds among the various highway systems and financial districts is governed by the provisions of Section 84-1817 of the Revised Code of Montana, 1947, as amended.

State construction funds for the primary system are divided among the financial districts in proportion to the incomplete or deficient mileage in each district. In District 8, the available State construction funds in fiscal year 1967 amounted to $634,000 and the federal matching funds to $830,000. The allocation of these funds within the financial district is on the basis of need. The more substantial primary system improvements currently underway in the Missoula urban area include the widening of U. S. Highway 12 and 93 from Missoula to Lolo and the widening of U. S. Highway 10 and 93 from Russell Street to Reserve Street.

The law provides that State construction funds for the secondary system shall be divided among the financial districts on the basis of a four factor formula. The formula assigns equal weight to rural road mileage, land area, rural population and value of rural lands. The apportionment procedure for the secondary system also carries the distribution beyond the financial district level to the county level. Each of the counties in the district share the financial district allotment on the basis of the same four factor formula. In fiscal year 1967, the allocation of State construction funds for the secondary system in District 8 amounted to $309,000 and the federal apportionment to $405,000. Missoula County received a total of $170,000 in State and federal funds.

Federal law requires that the secondary system routes be selected and developed in cooperation with local officials. In Montana the practice has been to grant the County Commissioners the initiative in selecting routes to be added to the secondary system and also in recommending priorities for construction projects to improve these routes. The State Highway Commission and the Bureau of Public Roads have the authority, however, to reject either route selections or priorities established for construction in the

event that these agencies feel that such recommendations are not in the best interest of the traveling public.

The secondary system monies can be accumulated from year to year for financing larger construction projects. The secondary system monies for Missoula County have been committed for about three years in advance for the construction of Reserve Street and for two years thereafter for the planned improvement of the Clark Fork River Bridge in East Missoula.

Federal aid urban funds may be expended only in cities over 5,000 population. State construction funds and corresponding federal matching funds are distributed to these cities in proportion to the population of the City and its environs as reported in the 1960 census. The definition of the urban area as applied to Missoula includes not only the incorporated area but practically all the developed area as well. In fiscal year 1967, Missoula's share of the State and federal urban funds amounted to $182,000. Urban funds can be expended on either the primary or the secondary systems within the urban limits.

County. The County road revenue is derived from the gross vehicle weight tax, registration fees, the federal government and property assessments. For fiscal year 1967, the budget for Missoula County contained the amounts from the various revenue sources as shown in Table XI-1.

Section 32-3601, R.C.M., 1947, Chapter 197, Laws of 1965 authorizes the County Commissioners to levy annually a tax not to exceed ten mills on the assessed property in the county and outside corporate limits for the purpose of raising revenue for construction, maintenance and improvement of public highways. The 1967 legislature raised the upper limit of the levy to 12 mills. For years, Missoula County has levied little for roads under this enabling legislative act. In fiscal year 1966, the County had no levy for roads; in fiscal year 1967, a levy of 0.179 mills was authorized. The entire 12 mill levy at the taxable valuation of the County of $23,395,279 would produce a revenue of $250,743.

In addition, the County has the authority to levy three mills for construction, maintenance and repairing public bridges. The incorporated areas, such as the City of Missoula, are included in this levy. In fiscal year 1967, the County levied 2.797 mills for this purpose.

TABLE XI - 1

MISSOULA COUNTY ROAD AND BRIDGE REVENUES FISCAL YEAR 1967

Source	Budgeted	Maximum Allowable
Auto Licenses	$250,000	$ 250,000
Road Tax[a]	4,192	233,395
Bridge Tax[b]	126,573	135,744
Special Bridge Tax[c]	---	226,240
Other Revenue	52,300	52,300
Subtotal	433,065	897,679
Additional Road and Bridge Tax[d]	---	452,580
TOTAL	$433,065	$1,350,159

[a]A levy of 0.179 mills of allowable 10 mills, increased to 12 mills by 1967 legislature on taxable property outside City assessed at $23,395,279

[b]A levy of 2.797 mills of allowable 3 mills on taxable property in the entire County assessed at $45,248,035

[c]Allowable levy of 5 mills on valuation of the entire County

[d]Allowable levy of 10 mills on taxable property in the entire County with voter approval

Source: Missoula County Budget, year ending June 30, 1967

The County may levy a special bridge tax not to exceed five mills on the taxable property to defray the cost of any bridge required to be constructed and maintained by the County in any city or town. In past years, the County has not exercised this option. The five mills, if levied in fiscal year 1967, would have produced a revenue of $226,240.

An additional ten mills can be levied in the entire County with the approval of the majority of voters for constructing roads and bridges. At the assessed value level in fiscal year 1967 in Missoula County, ten mills could have produced a revenue of $452,480.

As part of the 1967 statewide increase in the gas tax, Missoula County is expected to receive about $22,000 per year beginning July 1, 1967. These funds are earmarked for construction, reconstruction and repair of county roads and cannot be expended on maintenance of the County road system.

The County recently passed two bond issues to assist in financing the Russell Street and Higgins Avenue Bridges. At the end of fiscal year 1967, totals of $214,000 and $164,377 in principal remain outstanding. The annual principal payments amount to $53,500 per year on the Russell Street Bridge issue and $26,000 per year on the Higgins Avenue Bridge issue. At these rates, the former issue should be retired in 1971 and the latter in 1973 or 1974. Interest is paid on the outstanding balance at the rate of about 4.95 percent on the Russell Street Bridge issue and at about 5.4 percent on the Higgins Avenue Bridge issue.

Over the past years, the County has expended about 15 percent of its total road and bridge monies on capital improvements, such as new construction, reconstruction and major improvements on the county road system. In fiscal year 1967, this amounted to about $76,000.

City of Missoula. The primary source of revenue to the incorporated areas in Montana for the purpose of construction, improvement and maintenance of streets comes from property taxes. The other sources are the highway user charges of auto registration fees and parking meter revenue. Parking meter funds, in most instances, are deposited into the City general fund and are expended on other than street improvement projects. For fiscal purposes, parking meter revenues cannot be considered revenue available for street improvement projects.

During fiscal year 1966, the City of Missoula collected $207,000 from a ten mill assessment and $48,000 in auto registration fees. Additional funds for street improvement purposes were collected for payment of special improvement district bonds for street improvements.

Section 84-4701.1-4701.5, R.C.M., 1947, Chapter 82, Laws of 1965, allow city and town councils the option of making an all-purpose annual mill levy in lieu of multiple levies authorized, not to exceed the average number of mills levied for all purposes in the preceding three years. The City of Missoula has taken advantage of this enabling legislation and has adopted the all-purpose levy for the current fiscal year. Under the multiple levy procedure, the 1967 State legislature raised the ten mill limit to 12 for street construction and maintenance.

The additional one-half cent gas tax increase in Montana will result in added revenue to the City of Missoula of about $60,000 per year. The expenditure of these monies is limited to construction, reconstruction or repair of the street system subject to approval of the State Highway Commission. The monies can be accumulated in reserve over a number of years to finance larger construction projects.

Maintenance of the City street system has more than consumed the entire street improvement budget. No significant improvements above routine patching of chuckholes has been done for years. At the current taxation level and without additional sources of funds, the deteriorated street conditions are expected to continue indefinitely.

Summary of Funds Available. Street and highway construction funds available from the Federal Government, the State, the County and the City should be utilized to the fullest extent in the construction and improvement of street and highway facilities in the Missoula urban area. Table XI-2 shows the current sources and amounts of street and highway construction monies available.

Additional Funds Needed

In highway construction at the State and federal level, the principle objective is to complete construction of the Interstate Highway System by about 1975. In Montana, a large portion of the State collected highway user taxes will have to be used in matching federal interstate funds to complete construction of the Interstate system. No significant increase in federal or State revenues for construction

on the primary or on the secondary system can be anticipated prior to completion of the Interstate system.

Any substantial highway construction funds to be raised during the next eight years prior to completion of the Interstate Highway System will have to come from taxation of local property. However, the possible sources of additional funds from various governmental levels should be discussed.

State and Federal. It is unlikely that any additional State and federal funds can be made available to the local areas in excess of that shown in Table XI-2 between now and 1975.

Although a substantial construction program still remains to complete the Interstate Highway system, the Federal Government is looking ahead to assessing highway needs beyond that date. The Federal Highway Administration in the U. S. Department of Transportation has already laid the groundwork for establishing an additional federal aid highway system in the nation's cities over 5,000 population. There is no indication at this time of the amount of funds that may eventually be available or the date by which any such funds may be supplied.

This program is termed "TOPICS" meaning "Traffic Operations Program for Increasing Capacity and Safety." The initial step in implementing this program is to designate a system of streets previously ineligible for federal aid. The official designation of this system is Federal Aid Primary System II or FAP II.

Under the present federal-State matching formula in Missoula, the federal government would provide about 57 percent of the monies and the State and local governments the remaining 43 percent. Figure 44, shows the streets suggested for inclusion in the FAP II system. The designation of such a system requires approval of local officials, the State Highway Commission and the U. S. Department of Transportation, Federal Highway Administration.

The designated FAP II system in Figure 44 includes facilities that have been classified as local access streets in the Transportation Plan. The FAP II system may include:

a. Arterial highways and major streets (radial, crosstown, and circumferential) not already on either the federal aid primary or federal aid secondary system;

TABLE XI - 2

STREET AND HIGHWAY CONSTRUCTION FUNDS

Source	State Highway[a] Financial District 8	Missoula County	Unincorporated County	Missoula[b] Urban Area	City of Missoula
State and Federal[c]					
Primary	$1,464,000				
Secondary		$170,000			
Urban				$182,000	
County[c]					
Road Fund			$14,000		
Bridge Fund		62,000			
Gas Tax[d]		(22,000)			
City[e]					
Street Fund					---
Gas Tax[d]					($60,000)

[a]Includes Counties of Missoula, Granite, Mineral, Powell, Ravalli and Sanders

[b]Includes City of Missoula and adjacent urbanized area

[c]Fiscal year 1967

[d]Effective in fiscal year 1968

[e]Fiscal year 1966

Source: Financial records of State, County and City

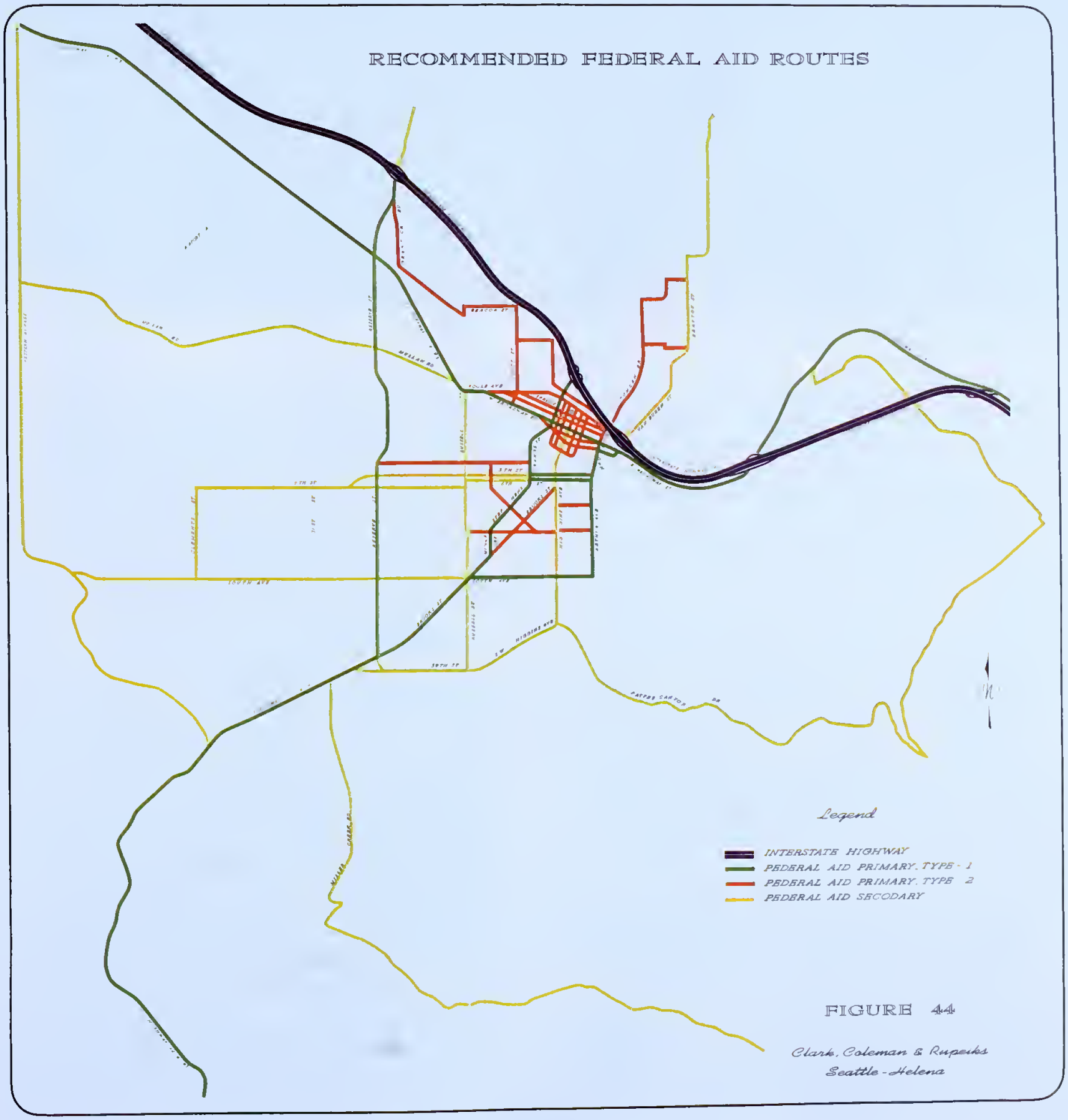


FIGURE 44

Clark, Coleman & Rupeiks
Seattle - Helena

b. Most, or all, of the street grid in the Central Business District; and

c. A limited street grid in other areas having particularly heavy concentrations of traffic.

The types of improvement on the FAP II system are limited to traffic operation improvements that can be accomplished within the existing right-of-way such as channelization of intersections, provision of additional travel lanes, construction of grade separations, installation of traffic control systems, development of traffic lanes for loading purposes and establishment of traffic surveillance systems.

County. The selection of improvement projects and establishments of priorities on the Federal Aid Secondary system is the responsibility of the County with approval of the State and the federal government. Since most of the secondary road monies come from road user charges throughout the area, the expenditure of these funds should also be made on the entire system within the County regardless of political subdivision boundaries.

It is recommended that the County levy five of the allowable 12 mills to improve roads in the urban area on the periphery of the corporate limits. It is desirable that the County continue with improvement of some of the major roads outside the corporate limits, thus providing continuity and coordination with the City's street improvement program. The recommended five-mill levy for County roads will produce an estimated $120,000 per year. All these funds should be spent on new or reconstruction of County roads on the recommended transportation plan system within the Missoula urban area.

City. In capital financing of street improvements, the City of Missoula is forced to look for bond monies because the current sources of funds from property taxation and license fees are consumed almost entirely in regular maintenance. Commonly, bonds of this nature are retired over a twenty to twenty-five year period. To commit the citizens of Missoula for bond payments over this period of time may be unwise due to the possible change in federal highway financing upon completion of the Interstate Highway system. It is too early to tell what will happen to the federally collected road user taxes upon completion of the Interstate. However, the possibility that more federal funds will become available to local communities should not be discounted. In light of these

circumstances, it may be wise for the community to limit a bond issue for street improvements to ten years. Early in the 1970's, the course of federal highway financing should be established and the City should then realign its long-range street improvement program accordingly. If substantial federal financial assistance will not become available and there will be no favorable legislative changes at the State level, it appears that the City will have to resort to bond financing to continue improving the street system. However, if additional federal funds do become available, the City may or may not have to resort to bond financing to provide matching funds.

A ten year graduated serial general obligation bond issue at an interest rate of 5.0 percent with an annual payment of principal and interest of $110,000, the amount of a five mill levy on assessable property, would finance $892,000 worth of street improvements. If the retirement schedule were extended over a twenty year period, the bond issue could finance $1,495,000 of street improvements.

Moderate street improvements can be carried out from the $60,000 annual allocation from the State as a result of the current increase in gasoline tax. These monies can be accumulated in revenue over a number of years to allow financing of larger street construction projects. It would be desirable if these monies could be pledged for payment of principal and perhaps interest charges in a new street improvement bond issue. The legality of this will require opinions from the State attorney-general's office and from bond attorneys.

A graduated serial bond issue of 20 year maturity at an interest rate of 5.0 percent with an annual principal and interest payment of $60,000 would have a present value of $815,000. A considerable amount of street improvements can be carried out for this amount. It may be desirable to secure voter approval pledging equal assessment of property for security thus reducing the interest rate.

Financing Responsibility

The system of Primary and Secondary Federal Aid routes in the Missoula area as shown in Figure 2 are performing their function well under the current travel demands. However, with the increase in travel demands over the years, the system of federal aid routes in Missoula should be altered. The Federal Aid Primary designation should be

removed from Higgins Avenue and sections of Brooks Street between Higgins and Middlesex. The section of Higgins Avenue between Broadway and Brooks, however, should be put on the secondary system. The link from VanBuren Street to Madison Street should become part of the primary system. The primary system should include Arthur Avenue from the south end of Madison Street Bridge to South Avenue, continuing on South Avenue from Arthur to Brooks. Fifth and Sixth Streets between Higgins Avenues and Orange Street should be designated as part of the primary system.

Sections of Reserve Street are presently on the Federal Aid Secondary System where substantial amounts of secondary road funds have been expended on improvements. The construction of Reserve Street between South Third and Mullan Road has been scheduled to be financed with secondary road monies. It is recommended that improvements on Reserve Street be continued to be financed from secondary road funds. However, in the future the route should become part of the Federal Aid Primary System with maintenance taken over by the State. The road user benefits derived from the construction of the Reserve Street route are more of a regional nature and the maintenance expense of such a route should be borne by a larger segment of the population than the Missoula urban area.

Shortly after completion of major construction on Reserve Street, the State Highway Commission should be petitioned to modify the Federal Aid Primary Highway System in the Missoula urban area as shown in Figure 44.

The Federal Aid Secondary designation should be removed from South Third Street and substituted onto South 7th Street between Clements and Inez. South Fifth and Sixth Streets between Orange and Russell Streets should be put on the secondary system. Eventual designation of this section as part of the primary system should be considered. Secondary designation should be extended west on 5th Street past Reserve Street to South 7th. The westerly by-pass route should be included on the Federal Aid Secondary system. Miller Creek Road should be put onto the Federal Aid Secondary system. The secondary designation should be continued on South Avenue west of Clements to the westerly by-pass.

The State of Montana and the Federal Government are responsible for financing the improvement of the Interstate Highway, Federal Aid Primary and Federal Aid Primary II systems in the Missoula study area. The State and the Federal Government, with the cooperation of the County, have the responsibility of improving the Federal Aid

Secondary system in the Missoula urban area. Improving City and County arterial facilities not on any Federal Aid system is the responsibility of the two governmental agencies within their respective jurisdictions. Table XI-3 shows the estimated 20-year street and highway program costs by financial classification.

Most of the 20-year recommended street and highway improvements in the Missoula Study Area are on the Federal Aid Primary or Secondary highway systems. Despite the need for improvements, the State and the Federal Government cannot embark upon a wholesale improvement program because of financial limitations. The City and the County should do their part in providing construction funds within their capabilities. The Federal Aid highway designation does not necessarily fix the responsibility for financing; rather it allows available federal aid monies to be spent over a larger system, in areas of greatest need.

TABLE XI - 3

FINANCIAL CLASSIFICATION OF IMPROVEMENT COSTS

System	Amount
Interstate	$ 18,000
FA Primary[a]	10,502,000
FA Primary II	2,262,400
FA Secondary[a]	4,619,800
City and County Arterials not on FA system	643,800
TOTAL	$18,046,200

[a]Improvement costs on Reserve Street have been included in FA secondary costs. It is recommended that improvements on Reserve Street continue to be financed from secondary funds but eventually the route should be put onto the primary system.

Source: Clark, Coleman & Rupeiks, Inc.

IMPROVEMENT PRIORITIES

The transportation plan recommends an array of improvements to be made over the twenty year plan period. The improvements should be implemented when the actual need has arisen, tempered by availability of funds. The recommended schedule of projects has been governed by relative traffic needs, and improvements have been programmed to provide useful systems when completed. The development program will necessitate a closely coordinated

TABLE XI - 4

STAGE DEVELOPMENT AND ESTIMATED COSTS FOR RECOMMENDED IMPROVEMENTS

	STAGE 1 (1968-72)	STAGE 11 (1973-78)	STAGE 1II (1979-84)	STAGE 1V (1985+)	Total
PRIMARY ARTERIALS - NEW CONSTRUCTION					
Reserve Street	$1,061,000				1,061,000
Orange Street		1,645,000			1,645,000
Brooks Street	999,400				999,400
VanBuren-Madison-Arthur			478,100		478,100
South 5th Street		134,700			134,700
PRIMARY ARTERIALS - RECONSTRUCTION					
Reserve Street	87,000	694,000			781,000
Russell Street					501,100
Orange Street	323,200	211,300			534,500
Stephens Avenue		336,900			336,900
Middlesex Avenue		121,200			121,200
Brooks Street	521,300				521,300
Higgins Avenue		221,100			444,300
39th Street		13,000			13,000
VanBuren-Madison-Arthur					447,600
Broadway	599,700	341,900		1,211,000	2,152,000
South 6th Street		148,700			148,700
South 7th Street		243,900			243,900
South Avenue			1,507,800		1,507,800
SECONDARY ARTERIALS - NEW CONSTRUCTION					
Western-by-pass				1,441,000	1,441,000
South Avenue Extension				206,600	206,600
31st Avenue			240,000		240,000
South Airport Road				365,300	365,300
Scott Street			330,700		330,700
Duncan Drive			115,000		115,000

TABLE XI - 4 (Continued)

	STAGE I (1968-72)	STAGE II (1973-78)	STAGE III (1979-84)	STAGE IV (1985+)	Total
SECONDARY ARTERIALS - RECONSTRUCTION					
Western-by-pass				301,000	301,000
South Avenue extension				251,600	251,600
31st Avenue			385,000		38,500
Miller Creek Road				139,400	139,400
8rooks Street		227,100			227,100
P ttee Canyon Drive				180,000	180,000
Scott Street			287,700		287,700
Toole Avenue		97,700			97,700
Spruce Street		69,800			69,800
M in Street		107,200			107,200
Front Street		153,700			153,700
Madison-Duncan Drive			672,100		672,100
VanBuren - Brayton			411,700		411,700
U. S. Highway 10-East Missoula			136,600		136,600
COLLECTOR STREETS - NEW CONSTRUCTION					
Woody Street		76,900			
LeVasseur Street		32,800			
Clay Street		26,900			
COLLECTOR STREETS - RECONSTRUCTION					
LeVasseur Street		32,700			
Clay Street		14,100			
LOCAL ACCESS STREETS - NEW CONSTRUCTION					
Ryman Street		18,000			
TOTAL	$3,591,600	4,968,600	5,390,100	4,095,900	18,046,200

Source: Clark, Coleman & Rupeiks, Inc.

effort, with the staged development to be accomplished within the framework of the financial capabilities of all participating agencies.

The program of improvements must maintain a degree of flexibility to permit modifications resulting from anticipated changes in land use development and from scheduling of federal, State and local funds. In addition to the funds required for actual right-of-way acquisition and construction, the expenditures included in each stage must be supplemented by funds for maintenance and necessary replacements.

The improvements program has been divided into four stages which extend to the year 1985 and beyond. The availability of funds does not appear to be adequate to finance the entire improvements program. A substantial amount of construction that is necessary in the twenty year plan period must be postponed beyond 1985 due to financial limitations. The recommended staging is as follows: Stage I - 1968 through 1972; Stage II - 1973 through 1978; Stage III - 1979 through 1984; and Stage IV - 1985 and beyond.

The following criteria were utilized in the establishment of construction priorities:

1. Priority should be given to improvements that will provide maximum service for present traffic demands.

2. Partial segments of the network should be usable as completed, rather than dependent on development of the total system.

3. Construction of segments of the system which are not completely functional or which contribute to other problems requiring special solution should be avoided, where possible.

4. The size of individual projects, especially in terms of overall cost, should be evaluated from the standpoint of overall program costs.

5. Right-of-way for major projects should be acquired as soon as possible to minimize costs and delays in construction.

6. The total cost allocated to each program stage should be based on the estimated financial capability of the road building agency during the particular stage of the program.

The detailed implementation program for the various segments of the transportation plan are shown in Table XI-4.

A cross reference can be made with the detailed breakdown of recommended improvements and costs previously presented in Table X-7. The improvement priorities are also shown in Figure 45 and summarized in Table XI-5.

Construction Stage I

Stage I construction extends from the year 1968 through 1972, and is estimated to cost $3,591,600, about 20 percent of the entire recommended construction program.

During the first five-year program, emphasis should be placed on completing construction of Reserve Street between Interstate Highway 90 and U. S. Highway 12 and 93. Improvement of U. S. Highway 12 and 93, Brooks Street, should be continued up to the intersection with Middlesex. Improvements on Orange Street between the Clark Fork Bridge and Stephens Avenue should be carried out. Improvement of West Broadway between Russell and Reserve Streets should be completed.

Construction Stage II

Stage II construction extends from 1973 through 1978. The total estimated expenditure is $4,968,600, or about 27 percent of the total recommended construction program.

In this time period, it is anticipated that the Reserve Street improvements be completed. Additional improvements on Orange Street between Interstate Highway 90 and Brooks Street should be carried out. Improvement of this section requires construction of a railroad underpass and a river bridge. The 5th , 6th and 7th Street one-way couplet should be put into full operation. Improvements on Central Business District streets should be carried out. Brooks Street between Middlesex and Higgins Avenue should be improved. Recommended improvements along Higgins Avenue should be carried out.

Construction Stage III

The Stage III construction period extends from 1979 through 1984. The total estimated expenditure for the third stage construction amounts to $5,390,100 or about 30 percent of the entire recommended construction program.

The major improvement in the third construction stage is the primary arterial connection from VanBuren to Madison and then along Arthur Avenue. Other improvements include sections of Russell Street, Higgins Avenue, South Avenue

TABLE XI - 5

SUMMARY OF CONSTRUCTION STAGE DEVELOPMENT COSTS

Stage	Period	Total Costs	Percent Total
I	1968 - 1972	3,591,600	20
II	1973 - 1978	4,968,600	27
III	1979 - 1984	5,390,100	30
IV	1985 or later	4,095,900	23
TOTAL		$18,046,200	100

Source: Clark, Coleman & Rupeiks, Inc.

IMPLEMENTATION PLAN FOR RECOMMENDED IMPROVEMENTS

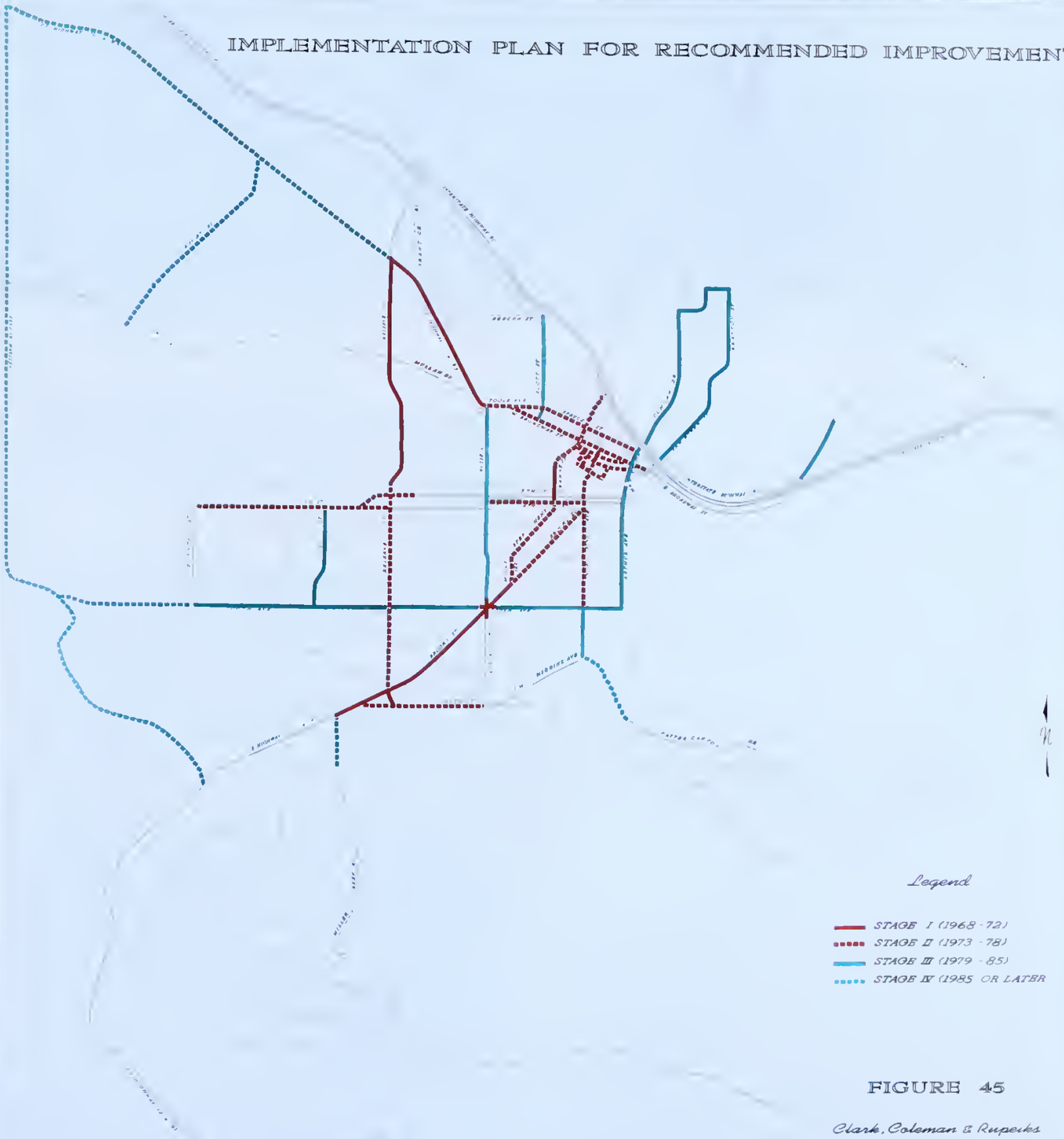


FIGURE 45

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and Scott Street. Improvements to Duncan Drive and Brayton Avenues are recommended for inclusion in this construction stage.

Construction Stage IV

Construction Stage IV, extending from 1985 and beyond, includes improvements of relatively low priority. The estimated cost of construction in Stage IV amounts to $4,095,900, or about 23 percent of the total recommended construction program. The recommended improvements in Stage IV include such items as the westerly bypass, U. S. Highway 10 and 93, west of Reserve Street, Miller Creek Road and Pattee Canyon Drive.

ADMINISTRATIVE CONSIDERATIONS

The recommended transportation plan, based on detailed appraisals of land use characteristics, growth trends, anticipated development and travel requirements of the Missoula area, has been developed through approved and tested procedures and is designed to meet future needs as defined by the detailed studies of expected growth. This plan should become a day to day workable tool in guiding the development of the community. The transportation plan recommendations have been incorporated into the Comprehensive Development Plan for Missoula as shown on the illustration attached to the inside of the back cover of this report.

The transportation plan as presented here should be used in the preparation of the street improvement program. It is recommended that the City of Missoula, in cooperation with the County, employ a trained and qualified traffic operations engineer, whose prime duties are to maintain the traffic operations function of the urban area in an efficient operating condition.

All traffic signs and signal installation should conform to the national standards as outlined in the "Manual on Uniform Traffic Control Devices for Streets and Highways, 1961." The indiscriminate use of "yield" signs should be eliminated. All arterial and collector streets should be stop sign lined at cross streets. The red blinking school signals should be removed and replaced with standard signal installations where warranted.

City Ordinance 896, adopted August 24, 1959, giving the City Council authority to designate truck routes should be brought up to date. Higgins Avenue and Brooks Street

to Middlesex should be taken off the truck route system and other facilities such as Reserve Street, a section of Russell Street and the 5th and 6th Street couplet to Reserve Street should be added. In the Central Business District, the truck traffic should be routed onto Toole Avenue, Railroad Avenue and Madison Street. The truck route designation on Broadway between Toole and Madison should be removed.

CHAPTER 12

CHAPTER XII THE CONTINUING STUDY

The Missoula Transportation Study represents the initial phase in developing a balanced transportation system. The current travel characteristics, as determined by this study, provide the basis for a long-range transportation plan. However, because of the effect of unforeseen elements in the future, the plan should be periodically re-evaluated in light of unanticipated changes in the area and pertinent advances in technology. In this way, modification of location and design segments can be accomplished in time to meet the needs.

PURPOSE AND GOALS

The Federal Highway Act of 1962 stresses the importance of a continuing comprehensive planning process carried on cooperatively by the states and local communities. This study is the beginning of the process. A program must be established whereby transportation planning is accomplished and resultant improvements are constructed using a step-by-step methodical process involving traffic engineers, design engineers and local planners. Overall re-evaluation and expansion of the plan should be accomplished by periodically going through the process cycle. This continuing process is characterized by four main divisions:

1. Inventory of existing basic factors which will influence development of the Missoula area as a whole and the transportation facilities in particular must first be accomplished.
2. Travel characteristics are surveyed to determine the present and desired uses of the transportation system and the dominant travel habits
3. Projections of future economy, population, land use and travel are made by correlating items 1 and 2
4. Revision of the plan is accomplished by using all this information to develop alternate plans and testing them to determine the most advantageous from all standpoints.

With the publication of this report, the first cycle of this process is completed. A suggested plan for a detailed continuing planning process for Missoula is outlined in Table XII-1 The traffic engineer and design engineer referred to in this outline are to be provided by the State of Montana,

while the local planner should be the responsibility of the Missoula City-County Planning Board.

THE PLANNING PROCESS

Instructional Memorandum 50-2-63, published by the Bureau of Public Roads in March, 1963, on the subject of Urban Transportation Planning states that: "The planning process includes the operational procedures and working arrangements by which short- and long-range highway and transportation plans are soundly conceived and developed, and continuously evaluated . . .

"The process is based upon the collection, analysis and interpretation of pertinent data concerning existing conditions and historical growth; the establishment of community goals and objectives; and forecasting of future urban development and future travel demands. It includes not only the initial preparation and evaluation of a transportation plan through an appraisal of practicable alternatives, but also periodic review and modification to meet changing conditions. In addition, it includes the preparation and dissemination of information needed by official agencies in their consideration of planning proposals and improvement programs, and for the encouragement of public understanding and support; and the preparation of recommendations concerning the scheduling and financing of highway improvements, coordination with other urban development programs, revision of ordinances and regulations, and additional legislation, if necessary.

"The planning process should be closely coordinated with policy making and program administration and should be organized with the objective of achieving agreement on action programs founded on factual information."[1]

The engineering staff at the state level and the Missoula City-County Planning Board at the local level should collect and maintain current data on travel and transportation, land use and related facilities to provide for updating this transportation plan as conditions change from those initially analyzed and forecasted. Maintenance of data should insure that land use changes differing from those forecasted are recorded in a manner that will permit a ready evaluation of their significance with respect to the transportation plan. It is of primary importance that as each portion of the transportation plan is placed in operation, an evaluation of its effectiveness be made. In any case, travel habits must be

[1] Memorandum 50-2-63, U. S. Department of Commerce, Bureau of Public Roads, March 27, 1963.

TABLE XII - 1

TRANSPORTATION PLANNING

	Traffic Engineer	Design Engineer	Local Planner
Inventory			
Area Economy			X
Population			X
Land Use			X
Transportation Network	X		X
Travel Characteristics			
Travel Desires	X		
System Use	X		
Technique Development	X	X	X
Projections			
Future Economy			X
Future Population			X
Future Land Use			X
Future Travel	X		
Revising the Plan			
Location Studies	X		X
Alternate Plans	X	X	X
Test Plan Adequacy	X		
Recommended Plans	X	X	X
Inventory			
Area Economy			X
Population			X
Etc.			

reappraised and the transportation plan updated whenever the departures from the land use forecast are significant or the effectiveness of new facilities differs appreciably from that anticipated.

The basic elements for which inventories and analyses are essential in a continuing transportation plan for Missoula are:

1. Economic factors affecting development
2. Population
3. Land use
4. Transportation facilities
5. Travel patterns
6. Terminal and transfer facilities
7. Traffic control features
8. Zoning ordinances, subdivision regulations, etc.
9. Financial resources
10. Social and community-value factors

Utilizing these ten basic elements and the continuing planning process, the general program for transportation planning is characterized by two types of activity:

1. Periods of intensified activity when the entire Missoula transportation plan and its relationship

to other elements of the Missoula Comprehensive Plan are re-evaluated and completely updated as a long-range plan, and

2. The routine continuing production of special studies, plans and capital improvement programs.

APPRAISAL OF THE SYSTEM

In this context the special studies should concentrate on basic elements. Economic development data, including employment, income, vehicle ownership and industrial activity, should be collected and analyzed. To form a basis for future land use and travel demands, population studies must be coordinated with the information on economic development. Timely information on land use will permit the analysis of trends in the development of the Missoula urban area. Elements directly oriented toward the transportation system, including transportation facilities, travel patterns, terminal facilities and traffic control features should be constantly studied by the traffic engineer. The planner will find it desirable to review frequently the land use controls in the light of the objectives for future development. The overall financial condition of Missoula City and County should be carefully observed for the purpose of analyzing the ability of these governmental units to finance their share of needed improvements. The social and community-value factors, which are receiving an increasing amount of national attention in the development of transportation plans, must of course be considered in the continued planning process.

In analyzing these elements, it is important to realize that transportation is a basic force in shaping the course of urban development, providing the mobility and accessibility that are fundamental to the existence of an urban area. It is a large factor in determining where and how people live and work. It enhances, or diminishes, existing land values, and creates opportunities for new land uses.

NEW PLANNING PROCEDURES

Like the nature of the thing for which it provides, transportation planning cannot be static. This feeling was amplified by the Second National Conference on Highways and Urban Development[2], sponsored by the American

[2] The Second National Conference on Highways and Urban Development, December 12-16, 1965, Williamsburg, Va.

Association of State Highway Officials, the National Association of Counties and the National League of Cities. The conclusions reached by the nationally recognized delegates from these organizations are summarized by the "Williamsburg Resolves." The resolves, which have the "unequivocal support of the Bureau of Public Roads" will form the bases of major transportation studies in the years to come and, as such, should be given proper consideration in the Missoula Continuing Study. A synopsis of the recommendations of this important conference is presented as a guideline for the Continuing Study.

1. Local governments in urban regions should develop workable administrative mechanisms through which the continuing, coordinated planning process can be carried out in cooperation with Federal and State agencies on a regional basis, thus permitting regional plans to be effectively implemented. The development of such mechanisms will facilitate participation in the continuing, coordinated, comprehensive planning process by local jurisdictions.
2. Planning agencies should emphasize the identification and evaluation of urban values and goals as an integral part of comprehensive transportation planning. There should be encouragement to develop more systematic techniques for rating all values and costs to be weighed in evaluating urban plans.
3. The planning and development of facilities to move people and goods in urban areas must be directed toward raising urban standards and enhancing the aggregate of community values, both quantifiable and subjective; it should be recognized that transportation values (safety, comfort, beauty, convenience and economy in transportation) are a part of, and are to be given proper weight in, the total set of community values.
4. Local governments dealing with regional and land-use plans are urged to take steps leading to improved urban design goals and standards, and an integrated design of the urban structure. Federal, state and local governments are urged to coordinate plans for the location and design of buildings, highways, and other facilities in the context of overall physical design of the urban environment. Where appropriate, advantage should be taken of the multiple use of land for transportation and other purposes. Transportation facilities should be attractively designed to the end that they contribute to the beauty of the areas

through which they pass, from the standpoint of both the users and the viewers of the facility.

5. Local governments in urban areas should act to develop plans and programs to improve the operation of arterial and collector street systems to their maximum capacity and efficiency. They should employ the most effective traffic operations management techniques, including coordinated traffic control systems, street widening and parking measures. They should also employ measures such as effective land-use controls, and the integration of traffic control systems on an areawide basis, to assure the efficient use of major arterial systems, including those provided by State and Federal action.

6. Study should be given to the appropriate nature, scope and cost of the continuing transportation planning process, and to determining an equitable sharing of financial responsibilities for the process.

7. Urban planning agencies should work actively to achieve public understanding of the planning efforts and participation of decision-making agencies at appropriate points in the planning process. Throughout the planning process, information on progress should be widely disseminated. To the extent feasible, data from planning studies should be made available to government agencies, and to civic, business, and other organizations, when the information can be useful in furthering community development.

8. To make planning more orderly, State and Federal agencies should coordinate their activities in the development of facilities in metropolitan areas.

9. Legal and financial devices should be worked out in each state for reserving rights-of-way for future transportation uses. The purpose should be to minimize inconvenience and hardship for affected property owners and to safeguard the public interest.

10. Comprehensive study and research should be directed to the problems of public finance in multi-jurisdictional urban areas. The objective is to develop principles and guidelines for improving intergovernmental fiscal arrangements, thus increasing capabilities for implementing urban transportation plans and programs.

SUMMARY

A continued, coordinated and cooperative approach is vital to the realization of the goals of a continuing study. This necessitates a mechanism, providing a means for involving the decision-makers of the area in the planning process. The cooperative planning action by the State of Montana and the City and County of Missoula is a long step toward this end. But, planning and plans are not an end in themselves.

There is a need to coordinate the study efforts at all governmental levels. This is necessary not only to achieve acceptance of feasible plans but also to develop programs which will translate these plans into capital improvements. Indeed, the basic problem is to fit highways to the community in a continuing planning process, and to coordinate all development, including highways, toward achievement of the established community goals and objectives.

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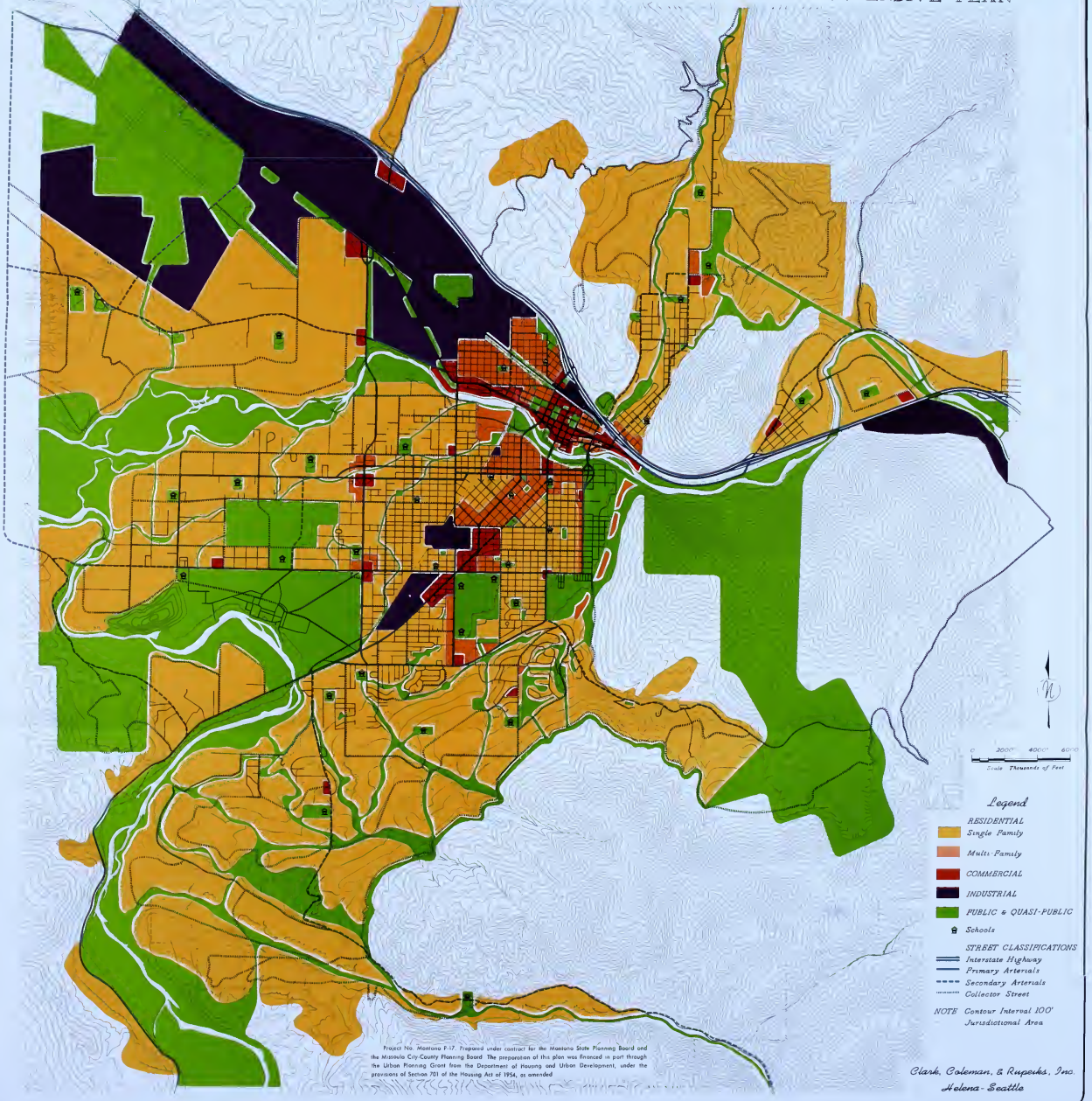
CONSULTANTS' STAFF

J. Aamot
G. Cowan (Resigned)
C. Daily, Resident Engineer (Helena)
S. Eyler
R. Fronczyk
L. D. Hagerty
J. Hall
N. Hawkins
M. Kask
M. Krumvieda
K. Lund
M. Madson
W. Parker
M. Rancich
R. Reupert
N. Sato
J. Silk (Resigned)
T. Smith
C. Suh
P. M. Thiel
D. Whitfield

MISSOULA COMPREHENSIVE PLAN



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